



R. S. Basser.

PALÆONTOLOGY OF CALIFORNIA.

VOL. II.

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⁽²⁾ GEOLOGICAL SURVEY OF ⁽¹⁾ CALIFORNIA.

J. D. WHITNEY, STATE GEOLOGIST.

PALÆONTOLOGY.

VOLUME II.

CRETACEOUS AND TERTIARY FOSSILS.

BY W. M. GABB.



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P R E F A C E.

VOLUME I of the Palæontology of California was issued in 1864, the preface bearing date September of that year. It contained descriptions of the Carboniferous and Jurassic fossils by Mr. Meek, and of the Triassic and Cretaceous by Mr. Gabb, and is illustrated by thirty-two plates. The present volume is devoted to the Tertiary and Cretaceous palæontology, and is entirely the work of Mr. Gabb. At the time the first volume of the Palæontology was published—which was also the first of our Report—it was thought that the whole of our material in this department of the Survey would be comprised in two volumes. Events have proved, however, as might perhaps have been foreseen, that at least three volumes will be required for the proper exposition of our palæontological results. The Cretaceous and Tertiary invertebrate material alone requires a volume by itself, and for a third, and possibly a fourth, we have still such additions as have been made to the Jurassic and Triassic, as well as all the fossil plants of various ages, and the vertebrate remains, chiefly of freshwater and land animals, and of Tertiary age; besides these, are the microscopic fossil organisms, both marine and freshwater, which are interesting, and will require considerable space for their illustration.

In the preface of Volume I of the Palæontology, a brief

synopsis of the field-work of the Survey was given, up to the close of the year 1863. In Geology Vol. I, a synopsis of the operations of the Survey was given up to the date of November, 1865, which is that of the preface of the volume. For the convenience of those who may possess the palæontological volumes of the Report only, the résumé of our work given in Volume I of that series, will here be continued, in as concise a manner as possible, up to the date of the suspension of the field-work in 1867, the failure of the Legislature of 1867-68 to make an appropriation for the continuance of the Survey, having compelled us to bring our active operations to a close. The question of the resumption of the field-work is one to be decided by a future Legislature.

The party under the direction of Professor Brewer, mentioned in the Preface of the Palæontology, Vol. I, as being in the field at the time of its publication, and which commenced operations in May, proceeded across the plains of the San Joaquin to Visalia, from which point they entered the Sierra, ascending King's River to its source, and exploring the whole region about the headwaters of that and Kern River. Thence they made their way across the range by a pass over 12,000 feet high; passed up Owen's Valley, ascended the west branch of Owen's River, crossing the Sierra again at an altitude of 12,400 feet, and thence descending to the head of the San Joaquin River. The exploration was continued through the region of the headwaters of that stream and the Merced, connecting the reconnoissance with that of 1863 around the sources of the Tuolumne. The whole expedition occupied about three months, during which time the geography and geology of a district including an area of over 10,000 square miles were, for the first time, explored, the whole region having previously been entirely unknown. The results

proved to be of the greatest interest, disclosing the fact that this was the highest part of the Sierra Nevada, and that it embraced the loftiest mountains and the grandest scenery yet discovered within the territory of the United States. For the details of this reconnoissance, reference may be made to Chapter X of Volume I of the Geology.

Mr. Gabb was in the field in Northern California, Southern Oregon and Idaho, from June 1st, 1864, to about the middle of October. During that expedition he obtained information and specimens proving the existence of the Cretaceous formation on Crooked River—a branch of the Des Chutes—the first discovery of rocks of this age anywhere to the east of the Cascade Range, as noticed in this volume, page 181.

Very little field-work was done during this year, or the next (in 1865), in regions where fossiliferous rocks occur. Mr. Rémond, during his explorations between the Merced and Stanislaus Rivers, in 1865, made for the purpose of working up the detailed geology of that region, discovered several new localities of Jurassic fossils, along the line of outcrop of the fossiliferous belt, previously noticed by different members of the Survey, as occurring on the Mariposa Estate. Several new species were found, which still remain to be worked up. During a portion of the year 1865 Mr. Gabb was employed in revising the palæontological materials of the Survey; but, owing to the limited appropriation by the Legislature of 1863-64, the field-work was necessarily on a very small scale.

A larger amount of money (\$15,000 a year, for two years) having been granted by the Legislature of 1865-66, the work was taken up again more vigorously at the beginning of 1866. Mr. Gabb, assisted by Mr. F. E. Brown, commenced early in

the year an exploration of the southern Coast Ranges, partly with the view of completing the palæontological collections in the Tertiary groups, and partly with the intention of working up the geology of the region, in which, at that time, a large amount of money was being expended for the purpose of ascertaining the value of the bituminous materials occurring there. This party continued in the field from January to June, adding largely to our knowledge of the geology of Los Angeles, Santa Barbara, and San Luis Obispo counties, and to our collection of Tertiary fossils.

Mr. Gabb continued his work northward from the Bay of San Francisco, accompanied by Mr. F. Coffee, during the months from July to November, and explored a large portion of Sonoma, Mendocino, and Humboldt counties, a region of sedimentary rocks, chiefly of Cretaceous age, but not rich in fossils.

A party was at work during this summer in the High Sierra, in Mariposa and Tuolumne counties, under the charge of Mr. King; but their operations were exclusively confined to a region of granitic and volcanic rocks, and no additions were made by them to our palæontological materials.

Another party, under my own charge, in Plumas County, during the same summer, made a pretty careful exploration of the fossiliferous localities around Genesee Valley, and collected some new species. They were not successful, however, in finding, in Plumas County, any new localities of importance, although the region was pretty carefully examined. A party, under Mr. D'Heureuse, was also in the field during the summer of 1866, in Kern County, but not in a fossiliferous region.

In 1867 there was no work done in the fossiliferous forma-

tions of California. The field-work was continued in Kern, Tulare, and Inyo Counties, by Mr. D'Heureuse and party; by Mr. Hoffmann and party in Mariposa and Tuolumne, and by Mr. Wackenreuder in the High Sierra, between Alpine and Plumas. Mr. Gabb, accompanied by Messrs. Wilson, Löhr, and Poston, explored the White Mountain Range, on the borders of California and Nevada. They continued their work east into the latter State (not at the expense of California), carrying their topographical and geological reconnaissance as far as the 116th meridian, including a large portion of the area between the 37th and 39th parallels. They continued in the field until the end of October, as long as the season would permit. Their collections embraced a considerable number of fossils of various geological ages, from Lower Silurian to Triassic.

A part of these was unfortunately lost in transitu; of the remainder, a portion has been worked up by Mr. Gabb, and the results will be published in the *Conchological Journal*. All the Palæozoic fossils collected by the Survey, together with a considerable amount of palæontological material from rocks of this age, collected by different members of the corps, and a considerable number of interesting specimens contributed by others, have been placed in Mr. Meek's hands for examination, with a view to future publication of the results by the Survey, or otherwise. We are especially indebted to Mr. J. E. Clayton for an interesting collection from Silver Peak and vicinity, and to Mr. S. S. Lyon for one from the neighborhood of Pahrnagat. Mr. Gorham Blake and Mr. A. Blatchly have also contributed valuable Palæozoic fossils (as well as Triassic and Jurassic), from various localities in Nevada.

The occurrence of rocks of Upper and Lower Silurian

age in Nevada was first made known by the Geological Survey, in the Proceedings of the California Academy (see Vol. III, p. 307) in 1866. Previous to that, in May of the same year, a synopsis of what was known in regard to the age of the stratified rocks of Nevada, was communicated to the same Academy (see Proceedings, Vol. III, p. 266). The collections received from Nevada at various times, together with the results obtained by myself in three visits to the State, and the important work of Mr. Gabb and party in 1867, have given us a pretty good idea of the geological structure of Western and Southwestern Nevada. The "Survey of the 40th Parallel," organized by the U. S. Engineer Office in 1868, and placed in charge of Mr. C. King, formerly of the California Survey, will give us a large amount of detailed and reliable information in regard to the northern and eastern portions of the State, and it only remains to work up the southeastern corner, a very interesting region, but one difficult of exploration. To this part of the State I had hoped to be able to send a party during the summer of 1868; but circumstances have rendered it impossible for me to carry out my plans.

At the meeting of the National Academy of Sciences, held at Northampton, in August last, Mr. Gabb read a paper giving the results obtained by himself in working over the collections of the Geological Survey, in reference to the subdivisions and palæontological relations of the Cretaceous and Tertiary rocks of California. In this paper Mr. Gabb proposes a new division of the Cretaceous of the Pacific coast, which is referred to in the body of the present volume, and the leading features of which may here be succinctly stated.

The Cretaceous formation is found covering large areas on the West Coast, from Vancouver and the adjacent islands of

the San Juan Archipelago, on the north, through Washington Territory and Oregon to Southern California, as well as isolated patches in Eastern Oregon and in Mexico. Except that in Mexico, which seems to be an extension of one of the best-known members of the Texan Group, it is divided into four groups, as follows :

1st. The Tejon Group, the most modern member, the Division B. of Palæontology, Vol. I, is peculiar to California. It is found most extensively developed in the vicinity of Fort Tejon and about Martinez. From the latter locality it forms an almost continuous belt in the Coast Ranges to Marsh's, fifteen miles east of Monte Diablo, where it sinks under the San Joaquin plain. It was also discovered, by the different members of the Survey, at various points on the eastern face of the same range, as far south as New Idria, and, in the summer of 1866, by Mr. Gabb, in Mendocino County, near Round Valley, the latter locality being the most northern point at which it is as yet known. It is the only coal-producing formation in California.

This group contains a large and highly characteristic series of fossils, the larger part peculiar to itself, while a considerable percentage is found extending below into the next group, and several species still further down into the Chico Group. Mr. Gabb considers it as the probable equivalent of the Maestricht beds of Europe.

2d. The Martinez Group is proposed provisionally, to include a series of beds, of small geographical extent, found at Martinez and on the northern flank of Monte Diablo. It may eventually prove to be worthy of ranking only as a subdivision of the Chico Group.

3d. The Chico Group is one of the most extensive and important members of the Pacific coast Cretaceous. Its exact

relations with the formation in Europe have not yet been fully determined, though it is on the horizon of either the Upper or Lower Chalk, and may probably prove to be the equivalent of both. It is extensively represented in Shasta and Butte counties, and in the foot-hills of the Sierra Nevada as far south as Folsom, occurring also on the eastern face of the Coast Ranges bordering the Sacramento Valley, at Martinez, and again in Orestimba Cañon, in Stanislaus County. It includes all of the known Cretaceous of Oregon and of the extreme northern portion of California, and is the coal-bearing formation of Vancouver's Island.

4th. The Shasta Group is a provisional name, proposed to include a series of beds of different ages, but which, from our imperfect knowledge of the subject, cannot yet be separated; it includes all below the Chico Group. It contains fossils, seemingly representing ages from the Gault to the Neocomien, inclusive, and is found principally in the mountains west and northwest of the Sacramento Valley. Two or three of its characteristic fossils have been found in the vicinity of Monte Diablo, and one of the same species has been sent from Washington Territory, east of Puget Sound. Few, or none, of its fossils are known to extend upwards into the Chico Group.

J. D. WHITNEY.

CAMBRIDGE, MASS., February, 1869.

NOTE.—Section 1, Part 1, was issued in February, 1866; the remainder of this volume was laid before the Philadelphia Academy, in a printed form, in December, 1868.

PALÆONTOLOGY OF CALIFORNIA.

VOL. II.

SECTION I.

TERTIARY INVERTEBRATE FOSSILS.

PART I.

DESCRIPTION OF NEW SPECIES.

TERTIARY INVERTEBRATE FOSSILS.

CANCER L.

C. BREWERII, n. s.

Pl. 1, Fig. 1.

HAND shorter, more robust and broader proportionally than that of *C. magister*, Dana; upper margin flattened and bordered by two well-defined ridges, each bearing about four tubercles; outer surface marked by five nearly obsolete ridges minutely tuberculated; fingers shorter than in *C. magister*, the movable one more curved and both with the denticles nearly obsolete.

Figure, natural size.

Locality: Near Santa Barbara. Pliocene. Collected by Professor Brewer.

A single well-preserved hand, and some fragments were found by Professor Brewer, all in one locality, on the Cayeguas Ranch. The hand resembles closely that of the common coast species, in its principal features; but its broader and more robust form, the absence of the marked serration on the back, and the curved finger, sufficiently distinguish it.

TRIPTERA, Quoy and Gaimard.

T. CLAVATA, n. s.

Pl. 1, Fig. 2.

SHELL small, subangulated on the sides, compressed and slightly constricted in the upper part, nearly elliptical in section below, pointed at the tip. Surface smooth or marked by a few very faint transverse undulations. Length about .3 inch.

Locality and position: From the Miocene, in a boulder near Griswold's, in the Coast Range, on the road to New Idria.

But a single specimen was found in a boulder, associated with *Pecten caurinus*, *Arca microdonta*, &c., and some other species, mostly indeterminate. I could detect no trace of the terminal septum, but this may be due to the extreme thinness of the shell and a portion of the interior being filled with crystals.

TROPHON, Montf.

T. PONDEROSUM, n. s.

Pl. 1, Fig. 3.

SHELL moderate in size, robust, thick; spire sub-elevated; whorls five, angulated in the middle, sloping above; suture irregularly impressed. Surface marked by eight or nine blunt varices, prominent and acute on the angle of the whorl, and commonly becoming more or less obsolete above and below; in the upper whorls the varices are replaced by mere elevated ribs, which become smaller until in the first three volutions they barely exist as undulations. Aperture broad; canal open, short, slightly recurved; columellar lip heavily incrustated; outer lip entire, sub-acute. Umbilicus well marked, but closed.

Figure, natural size.

Localities and positions: From the Pliocene of Kirker's Pass; also from the Miocene at Walnut Creek, Contra Costa County; and Griswold's, Monterey County, on the road to New Idria.

This fine species resembles somewhat *T. Belcherii*, Hinds, now living on the Coast, but can be at once distinguished by its smaller size, lower spire, broader and more robust form, and by the number and character of the varices. Some very much mutilated specimens from Griswold's, probably referable to the present species, have a row of prominent tubercles on the body whorl about half an inch below the angle.

NEPTUNEA, Bolten.

Chrysodomus, Swains.

N. RECURVA, n. s.

Pl. 1, Fig. 4.

SHELL of moderate size, fusiform; spire elevated, about as long as the mouth; whorls seven or eight (?) rounded on the sides, suture impressed. Surface marked by numerous, regular, rounded revolving ribs, with acute interspaces; these ribs sometimes show a tendency to alternation in size; the upper whorls sometimes, though not in all specimens, show a few faint longitudinal ribs. Aperture broad in the middle, narrowed in advance; lips simple; canal long, narrow, and very strongly recurved.

Figure, natural size.

Localities: Abundant in the Miocene at the Arroyo San Antonio, near Tomales Bay. Also found in the same formation at Foxin's Ranch, in Santa Barbara County, on the El Toro Ranch, and near Griswold's, in Monterey County; and in Morgan Valley, Lake County.

This strongly-marked species seems to be peculiar to the middle and upper portions of the Miocene formation.

It is allied to *N. (Fusus) exilis*, Con., of the Virginia Miocene (see Foss. Tert. Form. pl. 49, fig. 6); but the mouth is proportionally larger, the canal is more recurved, and it wants the "longitudinal rounded ribs" of that species. The revolving ribs in this species also are markedly rounded, while in the Eastern shell they are described as acute.

METULA, H. and A. Adams.

? M. REMONDII, n. s.

Pl. 1, Fig. 5.

SHELL broadly fusiform, spire elevated; whorls four or five (?) subangulated; suture impressed. Surface marked by numerous small revolving ribs, rounded with acute interspaces, and more

or less regularly alternating in size; these ribs are crossed by strong lines of growth, so as to present in some specimens an approach to a regular reticulation. Body whorl three-fourths of the whole length of the shell, broadly and regularly convex in the middle, with usually a revolving depression just below the suture; sometimes this groove or depression is replaced by a flat space. Mouth long and narrow; inner lip slightly incrustated; outer lip unknown; canal straight.

Figure, natural size.

Locality and position: From the Miocene of Arroyo San Antonio, near Tomales Bay.

The specimens are all preserved in a very hard gray sandstone, and I have been unable to expose the outer lip, so as to ascertain whether the characters exist on which the authors have mainly depended in instituting the genus. The form of the shell, however, and all the other characters are so nearly in accordance with their type, that I have ventured to place the species under their generic name provisionally.

CLAVELLA, Swains.

C. GRAVIDA, n. s.

Pl. 1, Fig. 6.

SHELL short, robust; spire moderately elevated, whorls five, suture channelled; body whorl bordered above by a strongly marked rim, adjoining the suture, and which extends to the upper whorls, though less distinctly marked; below this band is a slight depression of variable depth, and from that the volution swells rapidly. Surface marked by two or three rows of nodes on the middle of the whorl, and by fine revolving lines. Aperture broad in the middle, narrowing in advance; canal moderate, slightly twisted; inner lip slightly incrustated.

Figure, natural size.

Localities: From the Miocene; abundant south of Martinez, where it was collected by Dr. Fish and Mr. Mathewson. Also figured in the Pacific Railroad

Report, Vol. 5, Pl. 7, Fig. 63, from Ocoyo or Pose Creek, Tulare County, where casts were found.

It is possible that the specimens figured as No. 67, on the same plate, under the name of *Natica geniculata*, Con., may belong to this species, though the drawing is too imperfect for a satisfactory determination.

C. SINUATA, n. s.

Pl. 1, Fig. 7.

SHELL elongated, rather slender; spire low, convex; whorls four; suture deeply channelled, bordered by a thickened rim; body whorl convex in the middle, broadly grooved above, and excavated below. Surface marked by numerous fine revolving lines, and in the upper whorls by numerous radiating ribs. Aperture long and narrow; columellar lip sinuous, slightly incrustated; outer lip simple; canal slightly recurved.

Figure, natural size.

Locality: From the Miocene of Walnut Creek, Contra Costa County. Rare.

But two specimens of this curious shell have been found; one of which is of the size figured, the other not more than half as large.

PLEUROTOMA, Lam.

Turris, Bolt., not Humph.

P. (SURCULA) CARPENTERIANA.

Pl. 1, Fig. 8.

(*P. (S.) Carpenteriana*, Gabb; Proc. Cal. Acad. Nat. Sci., 1865, p. 183.)

SHELL large, fusiform; spire about as long as the mouth; whorls eight, subflattened on the sides, slightly concave near the suture, and very slightly convex below; suture impressed. Surface marked by numerous fine revolving ribs, rounded and sometimes alternating in size, especially on the lower part of the body whorl. Aperture narrow; inner lip faintly incrustated; outer

lip acute; sinus very broad and shallow; canal moderate, slightly twisted.

Figure, natural size.

Locality: From the Post-Pliocene, Santa Barbara.

This beautiful species is also found living on the coast of California, a beach specimen having been found at San Diego, and another dead specimen was dredged by Dr. Cooper, at a depth of 120 fathoms, in the same vicinity. The colors, when living, are a brownish-orange, with broken revolving bands of a light reddish-brown; these bands usually occur on the larger ribs, and are most closely placed on the middle of the shell.

In my description, above quoted, I inadvertently mentioned two fossil specimens. Only one has yet been found, but that is the most perfect specimen yet known of the species, except in color.

P. (S.) TRYONIANA, n. s.

Pl. 1, Fig. 9, and 9 a.

SHELL large, fusiform; spire about as long as the mouth; whorls about seven or eight, angulated in the middle, sloping concavely above, and very slightly convex below. Surface ornamented by a row of nodes on the angle of the whorl, and by numerous fine revolving ribs. Aperture narrow; inner lip slightly sinuous and incrustated; posterior sinus of outer lip broad and shallow; canal moderate, nearly straight.

Figures, natural size.

Locality: From the Post-Pliocene of San Pedro

This shell is closely allied to the preceding; but can be at once separated from it by the angulation of the whorls and the presence of the tubercles. The outline drawing, fig. 9 a, is restored from the lines of growth for the purpose of showing the form of the lip. The species has not, as yet, been found living.

P. (S.) PERVERSA.

Pl. 1, Fig. 10.

(*P. (S.) perversa*, Gabb; Proc. Cal. Acad. Nat. Sci., 1865, p. 183.)

SHELL small, sinistral, elongate, slender; spire high, apex usually bent to one side; whorls eleven to twelve, convex,

two nuclear whorls rather loosely twisted and more convex than the others; suture deep; body whorl nearly half of the entire length of the shell. Aperture broadest in the middle, narrowing regularly in advance; inner lip moderately incrustated; outer lip simple; sinus rather broad, shallow, rounded, and adjoining the suture; canal of variable length, often much larger than in the specimen figured. Color, in living specimens, a light reddish-brown.

Figure, natural size.

Locality: San Pedro, from the Post-Pliocene; not rare. Also found living, by Dr. Cooper, at a depth of sixty fathoms, off Santa Catalina Island.

P. VOYI, n. s.

Pl. 1, Fig. 11.

SHELL somewhat resembling the preceding species, but dextral and much broader; spire elevated; whorls perhaps seven or eight (apex broken), very convex; suture deep. Surface smooth, or only marked by lines of growth. Aperture broad; inner lip incrustated; outer lip acute; posterior sinus deep, rounded at the base, placed a little distance from the suture; canal slightly bent.

Figure, very slightly magnified; about one-fourth inch longer than the specimen.

Locality: Found by Mr. Voy near Humboldt Bay, below Bear River, Humboldt County: Miocene or Pliocene (?).

CLATHURELLA, Carpenter.

Defrancia, Millet, non Müll.

C. CONRADIANA, n. s.

Pl. 1, Fig. 12.

SHELL small, robust, broadly fusiform; spire high; whorls seven and a half, the first smooth and round, the remainder an-

gulated; concave above, convex on the side; suture very indistinct. Surface marked by ten or twelve large, rounded, radiating ribs, crossed by square elevated ribs, with sometimes smaller ones interposed; on the upper or concave portion of the whorl are six or seven fine linear revolving ribs; of the large revolving ribs, three or four only appear on the upper whorls, the body volution showing about fourteen. Aperture narrow; inner lip thinly incrustated; outer lip acute on the edge, thickened behind; posterior sinus narrow, deep, oblique, bordered by a thickened rim and almost adjoining the suture.

Figure, nearly four times the length of the specimen.

Locality: Not common, in the Post-Pliocene of Santa Barbara.

Specimens resembling this, but differing a little in the minute details of sculpture, were found by Dr. Cooper, in dredging off the shores of Santa Catalina Island. They should probably be placed under the same specific name.

RANELLA, Lam.

R. MATHEWSONII, n. s.

Pl. 2, Fig. 13.

SHELL moderate in size, robust, sub-compressed; spire high; number of whorls unknown; suture strongly impressed, bordered by a small, though abrupt truncation of the succeeding whorl; varices prominent, rounded, continuous. Mouth small; inner lip heavily incrustated; canal abruptly recurved. Surface marked by numerous, rounded, longitudinal ribs, crossed by square revolving ribs, with smaller ones interposed, and with flat interspaces.

Figure, natural size.

Locality and position: From the Miocene, south of Martinez; a single specimen found by Mr. Mathewson.

This shell can be at once distinguished by its compact form and the alternating revolving ribs. No allied species, either fossil or recent, has been found in California.

CUMA, Humph.

C. BIPLICATA, n. s.

Pl. 2, Fig. 14.

SHELL small, thick, angular; spire elevated; sides nearly straight, about as long as the mouth, in very old specimens a little longer; whorls five and a half to six, the first two smooth and round, the others concave and sloping above; suture faint, covered by a thin layer from the succeeding whorl; body whorl prominent and subangulated in the middle, bordered by a marked, angular rib at the top, which passes up on the preceding whorls; ornamented on the sides by about twelve short longitudinal nodose ribs, and by about eight or nine smaller revolving ribs, the uppermost of which crosses the top of the longitudinal ribs; these revolving ribs become fainter in front, until on the anterior fourth of the shell they are nearly obsolete. Aperture broad, angular above; columellar lip heavily incrustated; outer lip simple; canal slightly bent. Umbilicus broad, imperforate, bordered by two very strong oblique revolving ridges; anterior sinus deep, narrow, and oblique.

Figure, natural size.

Locality and position: Not rare in the Miocene, south of Martinez, where it has been collected by Mr. Mathewson and Mr. Voy.

ANCILLARIA, Lam.

A. FISHII, n. s.

Pl. 2, Fig. 15.

SHELL small, broad; spire high; whorls six; suture covered. Aperture narrow, acute posteriorly, broad in advance; inner lip moderately incrustated, with a single small fold in advance; outer lip acute, anterior sinus deep.

Figure, natural size.

Locality and position: From the Miocene, south of Martínez. Collected by Dr. Fish, of Martínez, and Mr. Mathewson.

This shell has few tangible characters except the high, acute spire, and the general outline. The small mouth will at once distinguish it from *Olivella biplacata*, and its size, from *O. Pedroana* (*batica* of Carpenter).

COLUMBELLA, Lam.

S. G. Alia, H. and A. Ad.

C. (A.) RICHTHOFENI, n. s.

Pl. 2, Fig. 16.

SHELL elongated, slender, subfusiform; spire high; whorls five and a half to six, slightly convex on the sides; suture deep. Surface smooth, or marked only by irregular, stray lines of growth, except on the anterior part, where there are a few oblique revolving lines. Aperture subquadrate; inner lip incrustated and bearing a few linear folds or teeth anteriorly; outer lip thickened and crenulate within; canal narrow and slightly curved.

Figure, magnified; length of largest specimen about .5 inch.

Localities and position: From the Pliocene, on the Russian River, collected by Baron F. Von Richthofen, and from the same formation in San Francisco County, in the bluffs on the coast, by M. Rémond.

NEVERITA, Risso.

N. CALLOSA, n. s.

Pl. 2, Fig. 17, 17 a, 17 b.

SHELL obliquely subglobose, compact; spire very small; whorls four and a half, almost completely hidden; suture sharp; body whorl broadly convex. Aperture narrow, very oblique, acute behind, round in advance; outer lip simple; inner lip covered by an unusually heavy callus which covers the umbilicus, is emar-

ginate above the umbilical region, and near the lower edge is marked by an oblique groove.

Figures, 17 and 17 *a*, natural size; 17 *b*, magnified view from above.

Locality: Walnut Creek, from the Miocene. A form somewhat resembling this has been found by Dr. Cooper at San Pedro; but it differs in the spire being more developed, and in the body whorl being less oblique and more expanded laterally.

CANCELLARIA, Lam.

S. Gen. Euclia, H. and A. Ad.

C. (E.) TRITONIDEA, n. s.

Pl. 2, Fig. 18.

SHELL large, robust; spire elevated, nearly as long as the mouth; whorls five, the first two and a half round and smooth, others bluntly angulated and descending straight, or with a slightly convex slope above; suture irregular, nearly obliterated by small lamellæ passing up from the succeeding whorls, in continuation of the lines of growth. Surface marked by a series of blunt nodes on the angles of the whorls, from which ribs or ridges, very irregularly dispersed, run to the suture above and downwards almost to the base of the shell; these are crossed by a large number of irregular revolving ribs of small size. Aperture suboval, broadest towards the base; inner lip heavily incrustated, bearing two large and one or two smaller folds. Umbilicus covered. Canal almost obsolete, slightly bent backwards.

Figure, natural size.

Locality: Picked up on the beach near San Pedro, by Dr. Cooper, and supposed to have washed out of the Post-Pliocene beds of that locality. This opinion is strengthened by the appearance of the specimen, it resembling in every respect a fossil, rather than a mere beach specimen of a living shell; and, in addition to that, no such shell, or even a fragment, has ever been found to indicate that the species may still be living.

C. (E.) VETUSTA, n. s.

Pl. 2, Fig. 19.

SHELL small, spire not so long as the mouth; whorls five or five and a half, increasing rapidly in size, angulated and truncated above, sloping convexly inwards below; suture moderately well marked, undulated. Surface marked by longitudinal ribs commencing at the suture, passing obliquely backwards to the angle, and then downwards to the anterior end; these are crossed by fine revolving square ribs, with broad, flat interspaces, and with sometimes smaller ones intercalated. Aperture long, biangular above, and narrowing in advance; inner lip heavily incrustated, bearing two heavy folds, and two or three fine ones above. Umbilicus narrow, covered by a very thick expansion of the inner lip, and in one specimen showing a slight perforation.

Figure, magnified. Length about one inch.

Locality: Found thus far only in the Miocene, south of Martínez. Two or three specimens collected by Mr. Mathewson.

It is possible that a further study of the species would prove that the perforated umbilicus mentioned above is not a constant character. It seems to be, in this instance, rather the result of accident than a specific character.

BITTIUM, Leach.

B. ASPERUM.

Pl. 2, Fig. 20.

(*Turbonilla aspera*, Gabb; Proc. Philada. Acad. Nat. Sci., 1861, p. 368.)

SHELL long, slender; whorls twelve or thirteen; nuclear whorls smooth, others marked by ten or twelve strong, longitudinal ribs, crossed by four or five sharp, filiform, revolving ribs with broad interspaces; suture deep. Under surface smooth, or marked by one or two ribs near the angle. Mouth longer than broad, produced below and slightly expanded at the columellar angle; lips acute.

Figure, magnified. Length about .35 inch.

Locality: From a Post-Pliocene Marl, Santa Barbara Collected by Dr. A. L. Heermann and others.

MELANIA, Lam.

M. TAYLORI, n. s.

Pl. 2, Fig. 21.

SHELL slender, elongate, many-whorled; whorls about twelve, flattened on the sides; suture impressed. Surface marked by three or four sharp revolving ribs, crossed by numerous curved longitudinal ribs, forming a prominent flattened tubercle at each intersection; there are about twenty-five of these longitudinal ribs to each volution; under side of the body whorl ornamented by four or five sharp revolving ribs. Aperture suboval; produced in advance; inner lip incrusted; outer lip simple.

Figure, natural size.

Locality: From a fresh-water Tertiary deposit on Snake River, Idaho Territory, on the road from Fort Boise to the Owyhee mining country. Collected by Mr. A. Taylor.

LITHASIA, Lea.

L. ANTIQUA, n. s.

Pl. 2, Fig. 22.

SHELL subglobose; spire moderately elevated; whorls five, rounded; suture strongly impressed. Surface smooth. Aperture oblique, suboval, subacute above, rounded and slightly expanded below; outer lip simple; inner lip heavily incrusted. Umbilical region flattened, bordered by an angular carina, and covered by an expansion of the inner lip.

Figure, slightly magnified.

Locality: With the preceding. Associated with these two shells is a little bivalve, perhaps a species of *Sphærium*, not in a sufficiently good state of preservation for description.

LITTORINA, Fer.

L. RÉMONDII, n. s.

Pl. 2, Fig. 23, 23 a.

SHELL small, conical, thick; spire elevated; whorls five, nearly flat on the sides, subangulated at the base; suture impressed, under side obliquely flattened. Aperture subtriangular; outer lip simple; inner lip somewhat flattened, thickened, bordered by a more or less marked rim, behind which is generally a faint umbilical depression. Surface smooth, or marked by a few faint spiral lines. The lower angle of the whorls is variable; sometimes it is roundly subangulated, and at others it is bordered by a prominent thickened rib or band.

Figures, magnified views of the two extreme forms. Length about half an inch.

Locality and position: From the Pliocene of Kirker's Pass. Found only in a single bed, and collected by Mr. Rémond.

TURRITELLA, Lam.

T. HOFFMANNII, n. s.

Pl. 2, Fig. 24.

SHELL large, many-whorled, elevated; suture deep; whorls increasing very gradually in size, flattened on the sides, slightly bevelled above and below the suture, and a little depressed in the middle; under surface nearly flat, or a very little convex. Surface marked sometimes by a few faint revolving lines. Aperture subquadrate.

Figure, natural size.

Locality: From a white Miocene limestone in the extreme southern corner of the Maxima Martínez Rancho, Santa Clara County.

This is the largest *Turritella* yet found in the State, and bears a close resemblance to *T. Saffordii*, nob., of the Cretaceous. It differs mainly in the suture not being so closely impressed as in that species.

TROCHITA, Schum.

T. FILOSA, n. s.

Pl. 2, Fig. 25, 25 a.

SHELL irregularly conical, variable in height and outline, some times half as high as broad, sometimes height and width equal, in outline sometimes circular, in other specimens very oblique; volutions about two and a half; suture obsolete; internal plate concave; outer edge regularly rounded. Surface marked by numerous fine radiating lines, often dichotomous.

Figures, natural size, from a very regular average specimen.

Locality: From the Miocene of Walnut Creek, Contra Costa County.

A single specimen was found with these, much higher than the average specimens, with a strongly marked spiral depression, and without the radiating lines. It will probably prove to be a distinct species, but in the absence of more material I do not feel warranted in naming it.

PACHYPOMA, Gray.

? P. BIANGULATA, n. s.

Pl. 3, Fig. 26.

SHELL large, conical; spire high; whorls five or more, sloping above, flattened on the sides; suture small. Surface ornamented by revolving rows of small tubercles; angles of the whorls marked by a larger series than on the rest of the shell; under surface nearly flat, marked by four or five revolving ribs with marked flat interspaces. Aperture large, subquadrate; outer lip simple; inner lip and umbilical region unknown.

Figure, natural size.

Locality and position: A single, somewhat injured specimen, from the Miocene, south of Martínez; collected by Mr. Mathewson.

Owing to the crystalline character of the shell, and the toughness of the matrix, I have not been able to expose all of the important parts of the surface of this

shell; the generic relations must therefore be left in doubt until further specimens are found exhibiting more of the details of the under surface. In some of its details, the present species resembles *P. gibberosum* living on the coast, but its strongly biangular form will serve to distinguish it.

TURCICA, H. and A. Ad.

SUBGEN. PTYCHOSTYLIS, Gabb.

(*Id.*, Gabb; Proc. Cal. Acad. Nat. Sci., Jan. 1865, p. 187.)

ANIMAL unknown. Shell resembling *Thalotia* and *Calliostoma*; conical, not umbilicated; spire elevated; aperture subquadrate, internally pearly; columella truncated, bearing an oblique fold on the anterior end and one above; outer lip and base acute, slightly thickened behind; umbilical region slightly excavated, and covered by a thin expansion of the inner lip.

T. (P.) COFFEA.

Pl. 3, Fig. 27.

(*P. coffea*, Gabb; Proc. Cal. Acad. Nat. Sci., Jan. 1865, p. 187.)

SHELL conical; spire elevated; sides flattened; whorls seven, first one smooth and round, succeeding ones subangulated at the lower margin, obliquely flattened above; body whorl convexly subtruncated below; suture channelled. Surface marked by a row of comparatively large tubercles on the upper margin of the whorl, adjoining the suture, and by a variable number of revolving, finely tubercular ribs on the sides; there are usually from six to ten on the side, and about the same number on the under surface of the body whorl; these tubercles are very small, and are generally arranged in an irregular quincunx; the under surface of the body whorl, just below the angle, is marked by a deep revolving groove. Aperture subquadrate; outer lip and base acute; inner lip narrowly emarginate beyond the truncated end of the columella.

Figure, slightly magnified.

Locality: From the Post-Pliocene of San Pedro and Santa Barbara. Also found living at Monterey. The epidermis in the living specimen is of a rich coffee-brown. The living specimen, from which the original description was written, was immature, having a full whorl less than the mature fossils now under consideration; the shell was also much thinner.

CALLIOSTOMA, Swains.

Zizyphinus, Gray.

C. TRICOLOR.

Pl. 3, Fig. 28.

(*C. tricolor*, Gabb; Proc. Cal. Acad. Nat. Sci., Jan. 1865, p. 186.)

SHELL small, conical; spire elevated, whorls seven; first whorl smooth, others concavely to convexly sloping above, more or less distinctly biangular on the margin; suture small, impressed. Surface closely and minutely marked with fine revolving granular ribs. Aperture subquadrate, internally nacreous; inner lip thick; outer lip and base acute.

Figure, a magnified view of a fresh specimen. Length about .5 inch.

Locality: Post-Pliocene, San Pedro.

Dr. Cooper has collected this shell, living, along the coast from San Diego to Half Moon Bay. Its peculiar colors suggested the specific name. It is a light-brown, banded by spiral lines of purple interrupted by white spots.

Figures 29 and 30 represent two of the many forms which have been discovered in the California Miocene, of which sufficient material has not yet been accumulated for satisfactory determination. Both of these specimens were found in the San Emidio Cañon, twenty miles west of Fort Téton, Los Angeles County, in a hard Miocene sandstone.

ZIRPHÆA, Leach.

Z. DENTATA, n. s.

Pl. 3, Fig. 31, 31 a.

SHELL large, subcylindrical, thin; ends broadly gaping; beaks anterior to the middle; covered by the dorsal plate; posterior dorsal margin of valves thin and sharply reflexed. Surface of anterior third of shell marked by serrated, squamose plates, as in *Z. crispata*; a faint line or rib passes between the middle and posterior third of the width, from the beaks obliquely down to the base; dorsal plate heavy, compressed, and divided into two concave surfaces by a sharp, angular ridge, commencing at the posterior end, and running forwards, slightly curved, ending in a tooth at a point about a third of the length of the plate from the anterior extremity.

Figures, natural size; fig. 31 a, represents the dorsal plate.

Locality: A single specimen from the Pliocene beds at the east end of Kirker's Pass, Contra Costa County.

This shell is closely allied to *Z. crispata*; but differs in its more regularly cylindrical form, the marked reflection of the posterior dorsal margin, and the angular dentated dorsal plate.

PANDORA, Brug.

P. SCAPHA, n. s.

Pl. 4, Fig. 32.

SHELL small, irregularly subquadrate; right valve flat; left valve slightly convex; beaks small, about a third of the width from the anterior end, which is prominent and regularly convex; cardinal margin slightly concave near the beaks, straight behind; base broadly and regularly curved; posterior end narrow and prominent. Surface marked by a few lines of growth.

Figure, magnified about a third.

Locality: From the Miocene, west of Martínez; collection of Mr. Rémond. The species appears to be rare. I have never seen it except in two small slabs, in which, however, a large number of specimens are closely packed.

HEMIMACTRA, Swains.

Spisula, Gray.

H. LENTICULARIS, n. s.

Pl. 4, Fig. 33.

SHELL large, flattened, thin, inequilateral, irregularly subquadrate; beaks eccentric, large, slightly curved forwards and inwards; anterior end broadly concave below the beaks, and convex below; base and posterior end regularly convex; cardinal margin sloping, nearly straight. Hinge teeth slender. Pallial sinus moderately deep, round at the base. Surface marked by irregular lines of growth.

Figure, natural size of an average sized specimen, with a transverse thickness of about 1.3 inch. One specimen is 3.8 inches long and 4.2 wide.

Localities and position: From the Miocene, south of Martínez, collected by Dr. Fish; also, west of Martínez, on the south shore of the Straits of Carquinez, and at Griswold's, near New Idria, Monterey County.

MULINIA, Gray.

? M. DENSATA.

Pl. 5, Fig. 35.

(*M. densata*, Conrad, *pars*; P. R. R. Report, vol. vi, p. 71, pl. 3. fig. 12.)

SHELL thin, equivalve, inequilateral; beaks large, nearly central; anterior cardinal margin broadly concave, posteriorly sloping with a slight convexity; base broadly and regularly convex; anterior and posterior ends slightly truncated. Hinge small; teeth slender.

Figure, natural size, from a specimen rather smaller than the average.

Localities: Common in the Miocene, south of San Pablo Bay; south of Martínez; near Walnut Creek, and in the hills east of Oakland, Contra Costa County; San Emidio Ranch; west of Fort Tejon (and Santa Barbara, Con.).

From its extreme thinness, this shell is almost always found very much distorted. The specimen figured by Mr. Conrad had been pressed out of its natural shape, and probably, having been misled by this inconstant form, he has confounded two species, widely different in character, under the same name.

SCHIZODESMA, Gray.

S. ABSCISSA, n. s.

Pl. 4, Fig. 34, 34 a.

SHELL large, thick, irregularly subquadrate; beaks large, prominent, pointed forwards, nearly central; anterior end obliquely truncated; base broadly rounded; posterior end very strongly and abruptly truncated, the truncation ending at an angular ridge which passes from the beaks to the posterior basal angle. Surface marked by rough, irregular lines of growth. Hinge composed of large, robust teeth; lateral teeth long and thick.

Figures, natural size. Fig. 34 a, represents the posterior end.

Localities: South of Martínez; near San Pablo Bay and Walnut Creek, Contra Costa County; Miocene.

From the character of the hinge, and the fact that this and the preceding species are often found associated, it is probable that this is the species which Mr. Conrad confounded with his *Mulinia densata*; although the shape of the shell precludes the possibility that this is the form to which he intended to apply the name.

PSEUDOCARDIUM, Gabb. N. Gen.

SHELL thick, heavy, equivolume, resembling *Lævicardium* externally; ligament internal. Lunale cordate, deeply impressed. Hinge composed of a large cartilage pit and in the left valve, a V-shaped tooth articulating in a corresponding depression on the opposite valve; two lateral teeth in each valve, very large and prominent; these teeth are comparatively narrow in the young

shells, but in adult specimens attain an unusually large size; pallial line unknown.

From all the characters of the hinge, and the internal position of the ligament, this shell is evidently one of the *Mactridæ*. Its external form, which induced Mr. Rémond to place it in the genus *Cardium*, has also suggested the generic name.

P. GABBII.

Pl. 6, Fig. 45, *a*, *b*, *c*, and *d*.

(*Cardium Gabbii*, Rémond; Proc. Cal. Academy, 1863, vol. 3, p. 13.)

SHELL large, thick, ventricose, elongated cordate; beaks very large, strongly incurved and lightly pointed forwards; anterior end sloping, rounded below, slightly concave above; posterior more or less distinctly truncated; base regularly convex. Lunule broadly cordate, very deeply impressed. Surface irregularly roughened by strong lines of growth.

Figures, natural size.

Localities: From the Pliocene, near Kirker's Pass, and rare in the Miocene, south of Martínez; also in the Sierra Bonita, Monterey County.

GARI, Schum.

SUBGEN. PSAMMOCOLA, Blainv.

G. (P.) ALATA, n. s.

Pl. 5, Fig. 36.

SHELL oval, thin, compressed, equivalve; anterior end a little the narrowest; beaks small, central; anterior and posterior ends regularly rounded; base broadly convex; anterior cardinal margin expanded into a long narrow ear, marked by one or two radiating grooves. Hinge composed of two prominent oblique teeth in each valve. Surface marked by a few irregular lines of growth.

Figure, natural size.

Locality: From the Pliocene beds near the east end of Kirker's Pass

VENUS, L.

V. KENNERLYI, Reeve?

Pl. 5, Fig. 37.

SHELL thin, subcompressed, rounded-subtriangular; beaks small, prominent, anterior; anterior and posterior ends about equal; base broadly rounded; posterior cardinal margin sloping convexly. Lunule small, elongate cordiform, flat. Surface marked by numerous irregular concentric undulations and fine striæ; internal margin entire, not crenulated. Pallial sinus deep, oblique, and narrow at the base.

Figure, natural size.

Locality and position: From the Miocene, at Griswold's, on the road to New Idria, Monterey County.

I have not had an opportunity of examining Reeve's figure or description of his species, and from the very meagre note on the species in Carpenter's last Brit. Ass'n Catalogue, I am unable to determine whether this should be referred to *V. Kennerlyi*, or not. Should it prove distinct, I propose the name of *V. pertenuis*.

MERCENARIA, Schum.

M. PERLAMINOSA, Con.

Pl. 5, Fig. 38.

(*M. perlaminosa*, Con.; Proc. Phila. Acad. Nat. Sci., 1855, p. 267.)

SHELL, large, thick, rounded subquadrate, very inequilateral; beaks anterior; anterior end excavated under the beaks, rounded below; base broadly rounded; posterior end convexly truncated; cardinal margin slightly convex. Surface closely marked by numerous prominent, recurved, lamelliform concentric ribs. Lunule marked by an impressed line. Hinge robust. Pallial line strong, sinus small, oblique, acute at the base; muscular scars nearly

equal in size; margin minutely crenulated; the purple color between the pallial line and the base is very persistent.

Figure, natural size.

Locality: From the Post-Pliocene beds on the beach at Santa Barbara.

Allied to *V. (Mercenaria) Ducatelli*, Conrad, of the New Jersey Miocene, but much broader posteriorly, and the ribs are more numerous than are represented in the figure of that species.

CHIONE, Megerle.

C. MATHEWSONII, n. s.

Pl. 5, Fig. 39.

SHELL very thick, obliquely cordate, very inequilateral; beaks anterior; anterior end sinuous; base broadly rounded; posterior end prominent, narrow. Lunule lanceolate, impressed. Surface marked by numerous irregular, concentric ribs; adjoining the cardinal edge and posterior to the beaks, is a narrow flat space running almost to the posterior end of the shell; inner margin entire, not crenulated. Pallial sinus deep; lower side curved, upper side straight.

Figure, natural size.

Locality and position: Not rare in the Miocene, south of Martínez; collected by Mr. Mathewson and Dr. Fish.

This shell is quite variable in outline, though all of the other characters are very constant. It seems related to *C. succincta* = *Nuttallii* and *Californica*, but differs in the entire absence of radiating ribs.

C. WHITNEYI, n. s.

Pl. 5, Fig. 40.

SHELL thin, oblique, rounded subcordate; beaks small, produced, pointing forwards; anterior end rounded, prominent, excavated above; base regularly convex; posterior cardinal margin rapidly descending, convex. Surface marked by numerous fine

concentric ribs, abrupt on the upper side, sloping towards the base.

Figure, natural size.

Locality and position: A single specimen collected by Prof. Whitney, near Martínez. Appears to be from the Miocene formation, from the character of the matrix.

Related to *C. foveolata*, Sby.; but differs in not being so produced behind, and in being more regularly striate.

CALLISTA, Poli.

C. VOYI, n. s.

Pl. 5, Fig. 41.

SHELL broad, inequilateral; beaks in advance of the middle; cardinal margin nearly straight and sloping; anterior end very much produced, rounded and narrow; posterior end obliquely truncated; base broadly and regularly rounded. Surface marked by numerous irregular and rather strong lines of growth.

Figure, natural size.

Locality and position: From the Miocene or Pliocene near Humboldt Bay, below Bear River, Humboldt County; collected by Mr. Voy.

This fine shell belongs to the type of *C. gigantea*, and is the only species of this group yet found in California. From *gigantea* it is easily distinguished by its broader posterior end, by the anterior end being shorter, more sloping above and narrower. The character of the surface is also different.

DOSINIA, Scopoli.

D. STALEYI, n. s.

Pl. 7, Fig. 42.

SHELL subcircular, thick, very inequilateral; beaks large, prominent, anterior. Lunule faint, rather large, slightly sunken. Surface smooth, marked by a few lines of growth near the base. Hinge robust.

Figure, natural size.

Locality and position: From the Pliocene on Mark West Creek, a branch of Russian River, Sonoma County; discovered by Mr. V. S. Staley, after whom it is named.

This shell can be at once distinguished from *D. ponderosa*, which is quite common in the Tertiary of California, by its less circular outline, the beaks being placed more in advance, by its being more convex, by its less strongly marked lunule, a differently shaped hinge, and its smooth surface.

D. CONRADI, n. s.

Pl. 5, Fig. 43.

(*D. alta*, Con.; Proc. Philada. Academy Nat. Sci., 1856, p. 315; not *D. alta*, Dkr.; nor *D. alta*, Con.; P. R. R. Rep., V. 5, p. 320, pl. 2, f. 2: *D. alta*, Con.; P. R. R. Rep., Vol. 6, p. 71, pl. 3, fig. 13, 13 a.)

SHELL rather small, thin, very elongated; beaks prominent, margins rounded. Lunule deep. Surface marked by concentric lines of growth.

Figure, natural size.

Localities: San Enidio Ranch, near Fort Tejon; also "Monterey" (Dr. Newberry). From the Miocene.

The original of Mr. Conrad's figure having been a distorted specimen, I have prepared the present drawing for the purpose of showing the true outline of the species. Unfortunately his name was preoccupied, and I have therefore dedicated the species to the pioneer of Tertiary Palæontology, not only for California but of the Atlantic States as well.

TAPES, Megerle.

? T. TRUNCATA, n. s.

Pl. 7, Fig. 44.

SHELL large, thin, transverse; beaks in advance of the middle, pointed forwards; anterior and posterior ends nearly equal, rounded; base broadly and regularly convex. Surface marked by numerous small, radiating ribs, nearly obsolete posteriorly.

and crossed by fine concentric, subimbricated lines; a sharp, angular ridge runs from the beaks backwards, nearly parallel with the cardinal edge, between which and the ridge is a flat space sloping inwards; internal margin finely crenulated.

Figure, natural size.

Locality and position: From the Miocene, at Griswold's, Monterey County.

But a single specimen was found, and I have been unable to expose the hinge. I have therefore not been able to determine positively the genus.

CYRENA, Lam.

C. CALIFORNICA, n. s.

Pl. 7, Fig. 45.

SHELL very variable in outline, suboval or subquadrate, more or less oblique; beaks prominent, varying in position from almost median to nearly submarginal, the variation being principally due to the greater or less prominence of the anterior end, and the greater or less obliquity of the shell; anterior end usually produced and most prominent above; posterior end more or less distinctly truncated, the truncation being oblique. Surface marked by numerous, irregularly disposed concentric lines. Hinge teeth sharply prominent; hinge plate slightly expanded on the ligament margin, extending a little beyond the general outline of the shell. Pallial margin strongly impressed.

Figure, natural size.

Locality and position: Very abundant in the Pliocene, near the east end of Kirker's Pass.

This species is the most variable in outline of any fossil I have seen in California, except the oysters and similar shells. No two specimens have the same shape, and by selecting a suitable series, differences enough could be found to make three or four species, sufficiently distinct, on paper. The large number of specimens, however, at my disposal, show conclusively that all belong to but one species. I have never seen the shell from any but the above quoted locality.

CARDIUM, L.

C. MEEKIANUM, n. s.

Pl. 7, Fig. 46.

SHELL resembling *C. corbis* (*Californianum* and *Nuttalli*), but oblique; beaks large, strongly incurved and pointed forwards; anterior end prominent and broadly rounded; posterior end abruptly truncated and very oblique. Surface marked by twenty-two large radiating ribs; these ribs, in the young shell, are acute, becoming rounded as it increases in size, and ultimately becoming distinctly flattened on top; they are crossed by irregular, curved, subsquamose plates, which towards the beaks lose their lamellar character, and are represented by little tubercles; the posterior face of the shell is not costate, or the ribs are represented by only a few indistinct radiating lines; the interspaces between the ribs are narrow and flat, or concave.

Figure, natural size.

Locality: Humboldt County, associated with *Callista Voyi*, &c.; collected by Mr. Voy.

From *C. corbis*, Mart. (which, according to Carpenter, is the same as *Californianum* and *Nuttalli* of Conrad), this shell can be distinguished by its form, which is more oblique than the most inequilateral varieties of that species. The ribs are proportionately larger and less numerous, being only about two-thirds as many. The abrupt posterior truncation, and the absence of ribs on that part, are also well-marked characters.

I take pleasure in dedicating this fine species to my friend, Mr. F. B. Meek, of Washington, D. C.

CONCHOCELE. *N. Gen.*

SHELL irregularly quadrate, very inequilateral; a sharp angular ridge passes from the beaks to the posterior end, between which ridge and the cardinal margin the surface is suddenly sunken, presenting the appearance of an offset, the truncation being at nearly a right angle, beyond which the surface retains the same

general curve as the rest of the shell; ligament external. Hinge composed of a single, long, sharp tooth, running from the beaks, parallel with the cardinal margin, almost to the posterior end. Pallial margin simple.

This shell appears to belong to the family of *Isocardiidae*, presenting some analogies to the genera *Edmondia*, *Unicardium*, and *Cardiomorpha*.

C. DISJUNCTA, n. s.

Pl. 7, Fig. 48, 48 a, 48 b.

SHELL subquadrate; beaks terminal, anterior; anterior end abruptly and angularly truncated; base broadly rounded; cardinal margin arched, sloping downwards towards the posterior end. Surface marked only by lines of growth, except near the posterior part where the peculiar truncation takes place, the surface suddenly descending at a right angle to the curve of the shell, for a short distance, and then resuming its former direction.

Figures, natural size; 48 a, an outline from above; 48 b, hinge.

Locality: From Dead Man's Island, near San Pedro Bay; from a hard sandstone associated with two or three previously known Tertiary Fossils. Probably Miocene.

I found a shell, abundant at Astoria, probably belonging to this genus. It was described by Mr. Conrad in the Wilkes' Expedition Report, p. 724, pl. 17, fig. 10, as *Venus bisecta*, and in the American Journal of Conchology, vol. 1, p. 153, as *Cyprina bisecta*.

LUCINA, Brug.

SUBGEN. HERE, Gabb.

SHELL having all of the usual characters of *Lucina*, except that the lunule is very deeply excavated, penetrating the hinge-plate, and almost perforating it; bounded anteriorly by the anterior lateral tooth, and posteriorly by the cardinal teeth.

This form is very strongly characterized, and seems to form a well-marked group in the genus. The following species exhibits the character more strongly

than any previously known. Two other species, both living on the Pacific coast, may also be included in the sub-genus; viz., *L. excavata*, Carpenter, Mazatlan Catalogue, p. 98, and a small subglobose species, with five or six large, rounded, somewhat curved ribs; found in the Gulf of California.

L. (H.) RICHTHOFENI, n. s.

Pl. 8, Fig. 49, *a*, *b*.

SHELL subglobose, nearly equilateral; beaks small, inclined forwards; margins regularly rounded; a more or less distinctly marked groove passes from the beaks to the posterior margin. Surface marked by numerous, more or less regular, distinct, rounded ribs.

Figure 49, magnified; 49 *a*, natural size, view of anterior end; 49 *b*, magnified view of the hinge, left valve.

Locality: San Fernando Valley, north of Los Angeles; Pliocene. Collected by Baron Richthofen.

This species can be at once distinguished by its thick shell and nearly globular form, from all of the other California *Lucinidæ*. Externally, it is almost identical with *L. Domingensis* in some of its varieties.

CRASSATELLA, Lam.

C. COLLINA.

Pl. 8, Fig. 50.

(*C. collina*, Con.; Pacific R. R. Rep., V. 7, p. 193, pl. 6, fig. 1, 2.)

SHELL large, compressed, variably subtriangular; beaks a little in advance of the centre; prominent; anterior end broadly and very slightly excavated above, prominent and rounded below; posterior end sloping sinuously, subangular below; base deeply convex; surface marked by irregular lines of growth; lunule deeply impressed; hinge robust.

Figure, natural size.

Locality and position: Miocene, from the Santa Iñez Mountains.

The figure in the Pacific Railroad Report is scarcely recognizable, but with the

assistance of the description, and from the fact that my specimens came from the original locality from which the first specimens were obtained, and this is the only species with which I am acquainted that is found there, there is but little doubt but that my reference of this form to Mr. Conrad's name, is correct.

MYTILUS, L.

M. MATHEWSONII, n. s.

Pl. 8, Fig. 51.

SHELL very large, thick, curved, width and thickness about equal in the centre, flatter towards the base; beaks terminal, blunt. Surface marked only by lines of growth and irregular concentric undulations.

Figure, natural size. Some specimens have been found an inch or two longer.

Locality and position: From the Miocene, south of Martínez, where it was found, not rare, by Mr. Mathewson and Dr. Fish.

Resembling *M. Californiana* in its unusually large size, it differs in being less flabellate, more curved, more convex, and in having none of the radiating ribs characteristic of that species.

MODIOLA, Lam.

M. MULTIRADIATA, n. s.

Pl. 8, Fig. 52.

SHELL moderate in size, variable in form, more or less curved; cardinal margin arched; posterior curved and descending more or less abruptly; anterior margin sinuated, more or less deeply excavated; beaks very small, subterminal. Surface marked by numerous fine radiating lines except on the anterior fourth, which is only marked by lines of growth.

Figure, natural size.

Localities and position: From the Miocene at San Emidio, west of Fort Tejon; and at Walnut Creek and Martínez, Contra Costa County.

ARCA, Lam.

A. SULCICOSTA, n. s.

Pl. 9, Fig. 53, 53 a.

SHELL thin, broad; beaks prominent, incurved, approximate, slightly twisted anteriorly; hinge line short; ends and base pretty regularly rounded, posterior basal portion a little the most prominent; area very narrow, slightly sunken. Surface marked by about twenty-five prominent square ribs, with flat, equal interspaces; these ribs are each marked by a more or less distinct median groove, and crossed by pretty strong concentric lines of growth, breaking up the surface into a beautiful beading. Hinge straight, composed of numerous fine teeth, very small and irregular in the middle, larger and slightly oblique towards the ends.

Figure 53, natural size; fig. 53 a, a magnified view of a few ribs on the anterior portion, to show the details of sculpture.

Locality and position: Found with *Dosinia Staleyi*, on Mark West Creek, Sonoma County, by Mr. V. S. Staley.

This species differs from *A. canalis*, Con., in being less ventricose, less prominent posteriorly, more produced in front, deeper from beaks to base, in being much thinner, and in the beading of the ribs.

YOLDIA, Möller.

Y. COOPERII.

Pl. 9, Fig. 54.

(*Y. Cooperii*, Gabb; Proc. Cal. Academy, 1865, p. 189.)

SHELL thin, subcompressed, very inequilateral; beaks minutely placed in advance of the middle, becoming more anterior as the shell increases in size; anterior end narrow, subacuminate; posterior end broadly rounded; base most prominent behind the middle, curving upwards to the anterior end. Surface sculptured

by numerous small concentric ribs, rarely dichotomous, abrupt on the upper side, and sloping downwards on the side towards the base. Muscular scars large, the posterior a third the largest, broadly suboval, anterior triangular.

Figure, natural size.

Localities: From the Miocene, south of Martínez, and north of Walnut Creek, Contra Costa County, and a specimen in the collection of the Academy of Natural Sciences, labelled "Oregon," probably Astoria. This species has not been found in the more recent Tertiary formation, though a fresh valve was picked up by Dr. Cooper on the beach at Santa Cruz. In this specimen the epidermis is of a bright olive-green and shining.

The shell varies considerably in outline according to its age. In young shells the beaks are about central; but in the adults, the posterior end increases so much more rapidly than the anterior, that the beaks are thrown forward so as to be barely more than a third of the width from the anterior extremity.

PECTEN, Brug.

P. CERROSENSIS, n. s.

Pl. 9, Fig. 55, 55 a.

SHELL equivalve, subcircular, broader than long, convex; beaks small; sides sloping concavely above, rounded below; ears small, subequal, roughened and irregular, sinus very small. Surface marked by eighteen or twenty flat ribs, with flat or slightly concave interspaces; margins undulated, the ends of the ribs being deeply emarginated, and the interspaces being prolonged into tongue-like processes.

Figure, one-half natural size (linear).

Locality: Cerros Island, off the coast of Lower California: probably Miocene. Collected by Dr. J. A. Veatch.

P. VEATCHII, n. s.

Pl. 10, Fig. 56.

SHELL large, equivalve, a very little broader than long; base regularly rounded; sides sloping above, with a slight concavity;

ears unequal; sinus in the right ear of the lower valve moderately deep; surface of ears covered by small radiating ribs and fine imbricating lines of growth; surface of valves ornamented by about eight broad, flat, subnodose ribs, arranged in pairs, and a few small linear ribs on the side; besides the ribs, the whole surface is covered by small radiating lines, and crossed by very irregular lines of growth, and very fine imbricating concentric lines.

Figure, natural size.

Locality: With the preceding.

OSTREA, Linn.

O. BOURGEOISII.

Pl. 11, Fig. 57, 57 *a*.

(*O. Bourgeoisii*, Rémond; Proc. Cal. Acad., 1863, p. 13.)

SHELL thin, irregularly oval, compressed and contorted near the beaks. Surface marked by a few irregularly squamose lines and faint radiating ridges. Hinge long oblique; ligament pit deep; muscular scar large, not very strongly marked.

Figures, natural size.

Locality and position: Near Kirker's Pass, Contra Costa County; from the Pliocene.

O. ATWOODII, n. s.

Pl. 10, Fig. 58, 58 *a*, and Pl. 11, Fig. 58 *b*.

SHELL broad, irregular, thin; partly attached, sometimes by nearly the whole of the lower surface; free surface of lower valve marked by numerous irregular radiating ribs crossed by lines of growth; upper valves more squamose and not radiated (in the only specimen I have seen). Hinge broad at the base,

triangular, not deep, and sometimes slightly oblique; inner margin of the shell not denticulated. Muscular scar broad.

Figures, natural size. 58 and 58 *a*, lower valves; 58 *b*, an upper valve found associated with the others, and apparently belonging to the same species.

Locality: On San Lorenzo Creek, Monterey County; either Miocene or Pliocene. Collected by Mr. M. Atwood.

This shell resembles somewhat the *O. conchaphila* from the coast, but differs in the style of sculpture, the shape of the hinge, and the absence of the internal denticulations.

O. TAYLORIANA, n. s.

Pl. 12, Fig. 60, 60 *a*.

SHELL large, thick, irregularly subtriangular, resembling somewhat some of the more massive forms of *O. Virginica*; not attached. Surface covered by heavy, irregular, subsquamose plates, showing more or less of a faint undulation on their edges. Interior unknown. Hinge broad and short(?).

Figures, natural size.

Locality and position: From the Miocene; from San Marcos Pass, near Santa Barbara. Collected by A. S. Taylor.

O. VEATCHII, n. s.

Pl. 11, Fig. 59.

SHELL large, subequivalve, varying from nearly equilateral to very oblique, the obliquity being always to the left side. Surface marked by ten or a dozen large, angular, radiating ribs, some of which arise at or near the beaks, the others branching from the first, or interpolated between them; the interspaces are angular, and the ribs are marked by more or less squamose plates, and occasionally these plates assume almost the character of spines; internally the ribs show only towards the margins. Hinge short, very broad and shallow; no crenulations or denticu-

lations near the margin. Muscular scar large, suboval to subquadrate.

Figure, natural size of a small and very equilateral specimen. The largest specimen found is about six inches long.

Locality: Cerros Island, associated with *Pecten Veatchii*, *P. Cerrosensis*, and the following species. Dr. J. A. Veatch.

O. CERROSENSIS, n. s.

Pl. 11, Fig. 61.

SHELL small, subequivalve, very oblique, strongly falcate, variable in form, upper edge entire, concave; lower margin very strongly undulated, each valve bearing four or five rounded, tongue-like processes, which alternate in the two valves; the margin, on each valve, between these processes, is very much thickened, and presents the squamose edges of successive layers of growth. Surface smooth, or marked only by rather indistinct lines of growth. Hinge long and very oblique, slightly curved. Muscular scars small, rounded subtriangular.

Figure, natural size.

Locality: With the preceding species.

TEREBRATELLA, d'Orb.

T. WHITNEYI, n. s.

Pl. 12, Fig. 62, 62 a.

SHELL subcircular, convexity of the two valves about equal, moderate. Lower valve, beak high, area narrow, high, and flat; foramen large, triangular. Upper margin of upper valve nearly straight, sloping slightly from the beak; margins of the shell regularly rounded. Surface marked by about thirty to thirty-five small, angular, radiating ribs, with angular interspaces; no median sulcus.

Figures, natural size.

Localities and position: From the Miocene, one mile east of the Excelsior Mine, Napa County, Prof. Whitney; and twenty miles east of Clear Lake, on the road from Colusa to the Hot Sulphur Springs; Dr. George.

MORRISIA, Davidson.

M. HORNII.

Pl. 12, Fig. 63.

(*M. Hornii*, Gabb; Proc. Phila. Academy, 1861, p. 371.)

SHELL minute, subcircular, flattened; beak acute; area narrow, long; a faint sinus usually occupies the middle of the lower portion of the upper valve; foramen large, acute above, and rounded or subangular in the upper valve. Surface, under a lens, presents a minutely granular appearance.

Figure, highly magnified. Length about .11 inch.

Locality and position: From the Post-Pliocene marl at Santa Barbara; collected by Dr. A. L. Heermann. This shell seemed to be abundant in the marl collected by Dr. Heermann; but I have never seen it among the shells collected by the Survey in that vicinity or elsewhere, and failed to find it myself, on subsequently visiting the locality.

ECHINODERMATA.

CLYPEASTER, Lam.

C. GABBII.

Pl. 12, Fig. 64, 64 a.

(*C. Gabbii*, Rémond; Proc. Cal. Acad., 1863, p. 53.)

ECHINARACHNIUS, Van Phels.

E. BREWERIANUS.

Pl. 12, Fig. 65, 65 a.

(*E. Brewerianus*, Rémond; Proc. Cal. Acad., 1863, p. 53.)

SCUTELLA, Lam.

S. GIBBSII.

Pl. 13, Fig. 66, 66 *a*.*(S. Gibbsii*, Rémond; Proc. Cal. Acad., 1863, p. 13.)

ASTRODAPSIS, Con.

A. WHITNEYI.

Pl. 13, Fig. 67, 67 *a*.*(A. Whitneyi*, Rémond; Proc. Cal. Acad., 1863, p. 52.)

A. TUMIDUS.

Pl. 13, Fig. 68, 68 *a*.*(A. tumidus*, Rémond; Proc. Cal. Acad., 1863, p. 52.)

A S T E R I A D Æ.

ASTERIAS, L.

A. RÉMONDII, n. s.

Pl. 13, Fig. 69.

ANIMAL large, robust, five rayed; rays more than twice as long as the diameter of the disk, thick on the margin. Upper surface covered by short, club-shaped spines, narrow towards the base, and bluntly rounded above; on the sides these same spines are more closely placed, and on the under surface they are so close

that they are in contact; ambulacræ broad, bearing numerous small, very slender spines.

Fig. 67, a view of an average sized ray, natural size.

Locality and position: Found abundantly at "Star Fish Point," on the Pinole Ranch, south of the Straits of Carquinez, about five miles from Martínez; Miocene.

This species was first discovered by M. Rémond, and is the only fossil star fish yet found in California. At the one locality above it is very abundant, but has never been found elsewhere. It resembles, in its general appearance, *A. ochracea*, Brandt, but the rays are more slender, it wants entirely the reticulated disposition of the spines; on the upper surface, the spines are larger, of a different form, and much more numerous. I have not seen a specimen retaining the disk and a whole ray so as to show the exact proportion of the two to each other; but by a comparison of a large series, the relative sizes of the parts given above seem to be, at least, very nearly correct.

PALÆONTOLOGY OF CALIFORNIA.

VOL. II.

SECTION I.

TERTIARY INVERTEBRATE FOSSILS.

PART II.

DESCRIPTION OF NEW SPECIES.

(CONTINUED.)

THE Tertiaries of California, although extensively developed, and usually highly fossiliferous, are of such a character that the included organic remains are rarely well preserved. No Eocene has ever been detected in the State; the Miocene fossils are almost invariably in bad condition; and it is only from the later deposits that good specimens have been obtained, unless in a few exceptional cases.

As a consequence of this state of things, but few new species have been found in these formations. Among about three hundred recognized species, less than a fifth are new. The majority of them are referable to living forms, while but a few can be with certainty recognized as having been previously described in the reports of Wilkes' Exploring Expedition, or in those of the Pacific Railroad Explorations. The following are all that have been collected since the preparation of the manuscript of the Palæontology of California, Vol. 2, Section 1, Part 1. Appended is a list of the species recognized during the progress of the Geological Survey, with the necessary synonymy.

TERTIARY INVERTEBRATE FOSSILS.

(CONTINUED.)

MURICIDEA, Swains.

M. (? *Phyllonotus*) PAUCIVARICATA, n. s.

Pl. 14, Fig. 1.

SHELL moderate in size, robust, fusiform, spire nearly as long as the aperture; whorls seven, subangulated, sloping above and bearing eight or nine large longitudinal ribs which develop into prominent nodes on the angle; on the body whorl these ribs disappear on the middle or towards the anterior part of the shell. Aperture subovate above, narrowed anteriorly, canal slightly deflected and often closed by a union of the two lips; labrum thickened behind, acute on the margin, coarsely dentate internally, and bearing a small compressed tooth a little below the middle, inner lip incrustated by a smooth plate; umbilicus subperforate. Surface marked by two or three varices, acute on the margins, never prominent, and not infrequently entirely obsolete; these varices are usually coincident with the longitudinal ribs; crossing them are from five to seven revolving ribs, between each pair of which are six to eight smaller rounded ribs with acute interspaces, giving the whole shell a closely costate surface; in well-preserved specimens the revolving ribs are crossed by small squamose plates, the remains of the lines of growth.

Length 1.8 inch, width 1.05 inch, length of aperture 1.1 inch.

Locality: Post-Pliocene; Santa Barbara, San Pedro, and San Diego. Not known in a recent state.

In this shell there is a combination of characters which allies it to two of the genera of the *Murices*. The nearly obsolete varices, and their small number, with the closed, tubular canal, would place it in *Muricidea*, but the tooth on the lip, still preserved on the varices, is the character on which Conrad founded *Ceras-toma*, antedated, however, by *Phyllonotus* of Swainson, who used the numerous varices as the leading character of his genus.

TROPHON, Montf.

T. SQUAMULIFER, Cpr. (*in lit.*) n. s.

"*T. satis turritâ*, pallide rufofuscâ; anfr. nucl.? norm. iv tabu-latis, tumentioribus, suturis ad angulum 80° — 100° acute im-pressis; costis rad. vi—vii vix varicosis, angustis, ad angulum posticum interdum spinosis, ad basim continuis; liris spiralibus primum iii fenestratis dein creberrimis, asperis, squamulatis, in-terstitiis angustis, plus minusve incisiss, canali longiore, rectiore, duabus trientibus aperturæ æquante, vix apertâ; apertura ovali, labro incrassato, intus circ. v dentati; labio lævi, crassiore.

"Long. .9, long. spir. .35, lat. .51, div. 66° .

"Hab. Living; Catalina Isd.; Post-Pliocene, Sta. Barbara.

"With the general aspect of *T. tenuisculptus*, it is at once recognized by the difference in sculpture. The fossil (unique) specimen is much finer than the im-mature living one sent by Dr. Cooper. In this the varices are not spinous at the angle, and the spiral sculpture is stronger. The difference, however, does not appear to be specific."

The above description and notes were sent me by Dr. Carpenter, in a letter, and were based on a unique fossil specimen found by myself at Santa Barbara, and an immature recent one from Catalina Island, found by Dr. Cooper.

NEPTUNEA, Bolt.

N. ALTISPIRA, n. s.

Pl. 14, Fig. 2.

SHELL allied to *N. decemcostata*, Say, sp., but more slender, and with a much higher spire; whorls angular, the upper surface

sloping concavely upwards to the suture at a considerably broader angle with the side than in Say's species. Surface bearing several large revolving ribs, one on the angle of the whorl; on the anterior part of the shell these ribs degenerate by becoming less elevated, but retain their width; between the larger ribs, are a few very faint revolving lines; no similar sculpture exists on the top of the whorls; the whole surface is crossed by pretty distinct striæ of growth. Aperture as in *decemcostata*, except that it is narrower.

Length, about 2.8 inch; width, 1.4 inch.

From the Pliocene of Eagle Prairie, Humboldt County.

This shell is closely allied to the Eastern *decemcostata*, and another form recently brought by Mr. Harford from Alaska, the *Middendorfii*, Cooper = *liratus*, Mart. Judge Cooper named his species, after a minute comparison of one specimen with 130 of the Atlantic *decemcostata*; subsequently Dr. Carpenter, after a similar investigation, pronounced them identical. I have compared several of the Alaska shells with a fine suite of Say's species in the Philadelphia Academy's collection, and believe I can see a constant difference, though in minute characters only. The present fossil, however, is much longer, more slender, with a higher spire and narrower mouth than any of the recent shells. The number of revolving ribs is perhaps about the same as in the living forms, but beyond the first two, they lose their elevation, and the interspace is marked by a smaller rib instead of minute lines. Unfortunately the anterior portion of my single specimen is broken so as to prevent as full a comparison of the characters as I could desire.

N. HUMEROSA, n. s.

Pl. 14, Fig. 3.

SHELL large, broadly fusiform; spire high; whorls seven or eight convex; body whorl with a rounded shoulder, above which the shell slopes concavely upwards to the suture, which is small and indistinctly marked; no longitudinal ribs, the first two or three whorls show faint nodes, and in some cases the later volutions are wrinkled by irregular growth. Entire surface covered by numerous small, rounded, revolving ribs, with acute interspaces, and sometimes exhibiting a tendency to alternation in

size. Aperture broad, subovate, acute behind, narrowing regularly in front; canal short, and slightly deflected; outer lip striate internally; inner lip rather heavily incrustated. Umbilicus well marked but closed.

Length about 5 inches. A specimen, with all of the body whorl, but having lost the spire, measures, from suture to end of canal, 3.5 inch, width of body 2.4 inch, length of aperture 2.7 inch. A smaller specimen shows that the total length of the shell is about twice the length of the mouth.

From the Pliocene of San Fernando, near Wiley's, on the San Fernando Pass, Los Angeles County.

A well characterized species, having no close relatives among the known fossil or recent forms of this region.

AGASOMA, Gabb. *N. Gen.*

Subfusiform, spire low, body whorl long; canal moderately produced and slightly deflected; aperture elongate, labrum simple, labium incrustated with a thin smooth plate; suture bordered as in *Clavella*.

This genus resembles *Clavella*, Swainson, in its general form, and in the bordering of the suture by an elevated portion of the succeeding whorl. It differs, however, in the very short spire and in the short and slightly curved canal. It is proposed to receive two species from the California Miocene, both of which, unlike the typical *Clavellas*, are ornamented by revolving ribs and by tubercles.

A. GRAVIDA, G.

(*Clavella gravida*, Gabb, Pal. Cal., Vol. 2, p. 4, pl. 1, fig. 6.)

The figure quoted above, does not exhibit all of the characters of the pillar lip. In all the specimens I then had, this part was covered by matrix which I was unable to remove. Further specimens show that it is curved, though to a less extent than that of *A. sinuata* figured on the same plate.

A. SINUATA, G.

(*Clavella sinuata*, Gabb, Pal. Cal., Vol. 2, p. 5, pl. 1, fig. 7.)

A rare shell, only found in the lower portion of the Miocene, associated with *Mulineæ densata*, *Ostrea Titan*, &c.

SURCULA, H. & A. Ad.

S. TRYONIANA, G.

(*Pleurotoma* (*Surcula*) *Tryoniana*, G., Pal. Cal., V. 2, p. 6, pl. 1, fig. 9.)

This very rare shell is known by but two specimens. One is that figured as above, from the Post-Pliocene of San Pedro; the other is a dead and very much decayed shell, picked up by me on the beach near San Pedro, but undoubtedly recent.

NASSA, Lam.

S. G. CÆSIA, H. & A. Adams, 1857.

Schizopyga, Con., 1857.

In "Genera of Recent Mollusca," H. and A. Adams describe a large number of subgenera of *Nassa*, among which is the present one. The description reads, "Spire elevated, whorl rugose or cancellated, rounded; inner lip with the callus defined; outer lip thin, simple." This description covers all of the subgeneric characters which belong to either *Nassa perpinguis*, Hinds, or *Buccinum fossatum*, Gld. The former species was placed by them correctly, under this head; while the latter, a closely allied species, and one which, in some of its varieties, is difficult to distinguish from some of the varieties of *perpinguis*, is placed by them under the subgenus *Tritia*. To add to the confusion, *N. Cooperii*, Fbs., is also included in *Tritia*, while *mendica*, Gld., is called a *Niotha*. The last two species belong, without question, to the same group, and are so nearly related that their specific difference has been denied more than once, by excellent authorities. With this portion of the question, however, we have nothing to do at present.

The Adams's have defined clearly all of the important characters of the group to which they have given the name; unless we add that, in both the species in question, the callus on the inner lip is transversely wrinkled. The same year, in Vol. 6, Pacific Railroad Reports, Mr. Conrad described a genus, of which he said, "the above genus is probably related to *Cancellaria*," and which he defined as follows: "Bucciniform; columella concave, plicate; lower part of body volution deeply channelled, the channel emarginating the columella."

It will be seen that the description is based principally on the deep depression formed by the twisting of the anterior part of the shell, a character of common occurrence in a majority of the *Nassas*, and visible to a greater or less extent in

every species. The most important character, that of the callus, was entirely lost sight of from the fact that the specimens were mutilated, and the author was not even aware of its existence. His name *Schizopyga* will therefore have to be dropped, and *Cæsia* adopted in its place.

For the leading points of synonymy of these two species, see appended list.

FICUS, Bolt.

F. PYRIFORMIS, n. s.

Pl. 14, Fig. 4.

SHELL pyriform, body whorls rounded, slightly flattened on the sides, shouldered, the top sloping upward, with nearly a straight line to the suture; whorls four to four and a half, spire low, suture indistinct. Aperture rather narrow, canal moderate, and slightly curved. Surface ornamented by about forty small, distinct revolving ribs, with occasional smaller ones interposed, all crossed by prominent lines of growth, more closely placed, and not so large as the revolving sculpture.

Length, 2.3 inch (end of canal broken); width, 1.2 inch; height of apex from posterior angle of aperture, .35 inch.

From the Miocene, Martinez. Collected by Mr. Mathewson.

From the recent *F. Dussumieri*, its nearest ally, this species differs by its slightly higher spire and less slender, regular form, narrowing more suddenly in advance. From the lines of growth, the canal, which is broken in the present specimen, seems to have been shorter than in the living shell.

F. NODIFERUS, n. s.

Pl. 14, Fig. 5.

SHELL subpyriform, short, robust, subangulated, side and top of body whorl flattened, upper surface nearly straight, and sloping directly upwards to the suture; upper angle of the whorl carrying a series of about ten flattened nodes, in some cases double; below these, about the middle of the whorl, is another series, less

prominent, each a little more in advance than the corresponding one above, and connected with it by a faint rib, or rather an undulation of the surface; spire low, whorls five, apical angle a little more acute than the superior slope of the last whorl. Surface marked by numerous small revolving ribs, with broad, flat interspaces, in which are usually one or more additional linear ribs, or fine elevated lines, the whole crossed by minute lines of growth. Aperture broad, canal short.

Length (about) 1.9 inch; width, 1.4 inch; height of spire from internal angle of mouth, .3 inch.

From the Miocene at Griswold's, between San Juan and New Idria, Monterey County; Pliocene, Wiley's, San Fernando Pass, Los Angeles County.

A very strongly characterized and peculiar species, quite rare. It has never yet been found as recent as the Post-Pliocene. The best preserved specimen yet obtained, was found by Mr. Frank E. Brown, in the rich fossiliferous Pliocene Sandstones of the San Fernando Pass, at the west end of San Gabriel Mountains.

SINUM, Bolt. 1798.

Sigaretus, Lam. 1799.

S. PLANICOSTUM, n. s.

Pl. 14, Fig. 6.

SHELL oblique, thin, semiglobose; spire small, somewhat elevated; whorls three and a half to four, rapidly increasing in size; suture small but distinct; body whorl very oblique, ornamented by numerous square revolving ribs with flat interspaces of about equal size; umbilical margin acutely rounded; umbilicus imperforate. The under surface, inside of the margin, not costate, but marked by strong lines of growth. Aperture very large, sub-elliptical, slightly emarginate by the encroachment of the body whorl; outer lip acute, inner lip slightly thickened.

Length, 1.2 inch; width, 1.3 inch; greatest diameter of mouth, 1 inch; lesser diameter of mouth, .8 inch.

Not rare in the Pliocene of San Fernando; collected by Messrs. Brown, Peckham, and others.

According to the common usage, that of adopting the oldest name since the date of Linn. Syst. Nat. 10 Ed., the name *Sinum* of Bolton, will have to be used for this genus, having a year of precedence over *Sigaretus*. It is unfortunate that we are obliged to drop names so familiar as the latter, though, if we do not follow some such rigid rule, it is impossible to tell where the diversity of opinions will take authors in the choice of generic names. Klein's name of *Catinus*, which has been used by Adams, Conrad, and others, dates back to 1753, but there are other older names, and a growing tendency is developing itself to use the oldest name that can be ferreted out, even if the author was not strictly binominal.

CANCELLARIA, Lam.

C. GRACILIOR, Cpr. (in lit.) n. s.

"C. t. elongatâ, gracili, elegantissimâ; anfr. nucleosis ii, majoribus, valde declivibus, lævibus, apice immerso; norm. v tumulentibus, superne vix subangulatis, suturis valde impressis; costis radiantibus x rotundatis, ad basim obsoletis, interstitiis undatis, majoribus; lirulis spiralibus exiguis, subdistantibus, supra costes et interstitia eleganter transeuntibus, postice ii minoribus, in medio primum iii, postea vi crebrioribus, circa basim attenuatam vi lineis distantibus; aperturâ subquadratâ, antice dilatâtâ; labro acuto; labio inconspicuo; columello plicis ii minoribus, declivibus, antice tortâ, plicæ terciæ simulante, sed vix emarginata."

"Long. .35, long. spir. .21, lat. .16, div. 38°."

"Hab. Santa Barbara, Post-Pliocene. Of this extremely elegant species, two specimens were found by Mr. Gabb, of which one is very perfect. It greatly resembles *C. modesta* from Neeah Bay, but is much more slender. The nucleus is chrysodermoid, very slanting, with sunken spire."

C. ALTISPIRA, n. s.

Pl. 14, Fig. 7.

SHELL thick, robust, broadly fusiform; spire high, nearly as long as the aperture; whorls six or seven (?—apex broken), angu-

lated, sides flattened, upper surface sloping; suture distinct, impressed. Surface ornamented by about a dozen small angular nodes on the upper angle of the whorl, from which faint longitudinal ribs descend over the body, becoming obsolete about the middle; above similar ribs continue to near the suture; on the earlier whorls these ribs are proportionately much larger; crossing these are three or four elevated revolving striae above the angle, and about twenty below; these alternate pretty regularly in size, eleven or twelve of them being large, the others much smaller; lines of growth faint in the middle, more distinct towards the two ends of the body volution. Aperture moderate in size, broadest in the middle; outer lip simple; inner lip rather heavily incrustated, bearing two strong, rather distant folds.

Length, 2.3 inch; width, 1.2 inch; length of aperture, 1.3 inch; width, .55 inch.

From the Pliocene of San Fernando Pass. Coll. by Mr. Frank Brown—a single specimen.

TROCHITA, Schum.

T. INORNATA, n. s.

Pl. 14, Fig. 8, 8a.

SHELL low, irregular, slightly oblique, nearly circular; volutions about two to two and a half; suture linear, indistinct; surface entirely without ornament, bearing only a few lines of growth; margin of internal plate sinuous.

Diameter, 1.1 inch; height, .6 inch.

From the Upper Miocene, near Half Moon Bay.

ACMÆA, Esch.

A. RUDIS, n. s.

Pl. 14, Fig. 9, 9a.

SHELL moderately large, subelliptical, outline slightly undulated, not distinctly emarginate; apex subcentral, prominent,

very slightly produced and pointed to one side in the axis of the shorter diameter of the shell. Surface irregularly rugose, the plications or undulations showing a tendency to radiation, though faintly.

Longest diameter, 1.6 inch; shortest, 1.3 inch; height, .35 inch.

A single specimen from the Pliocene of San Fernando, near Wiley's.

Although I have but a single specimen of this shell, and it belonging to a genus in which specific characters are usually difficult to define, I feel warranted in naming it on account of its marked dissimilarity from all the other known species on the coast. It approaches most nearly in size *Lottia gigantea*, but the central and more elevated apex will at once distinguish it; from *Acmæa patina*, *pelta* and *scabra*, it can be known by the more elliptical form, undulated surface, more elevated apex and irregular outlines, while from *A. persona* and *spectrum*, its central apex, thrown to one side, instead of in advance, the absence of the strongly marked regular radiating ribs, and its larger size, separate it. How far the specific value of all the characters given in the description will extend, cannot be definitely ascertained except by an examination of more specimens. It is not improbable that the irregular outline and the undulating ribs on the surface may be due to a great extent to the form of the surface to which the shell was attached during life. It is well known that these shells, like most other forms which attach themselves to one spot, often borrow the pattern of the surface on which they grow. This is often shown by barnacles, cryptas, and anomias; the present genus rarely going beyond a mere distortion of its normal form, or the assumption of a few abnormal undulations. When the surface to which the young animal fixes itself is too rough, it not unfrequently smooths a spot corresponding in size with the exposed portion of the animal. This I have observed in the case of *Acmæa persona* and *A. spectrum* at Santa Barbara, where, growing on a coarse-grained metamorphic sandstone, almost every shell fits into a little pit, barely more than a line in depth, level at the bottom, and corresponding exactly to the form of the shell.

ZIRPHÆA, Leach.

Z. GABBII, Tryon.

Pl. 15, Fig. 10.

(*Zirphæa Gabbii*, T., Proc. Phil. Acad., 1866, p. 144, pl. 1, fig. 1.)

This shell was described by Mr. Tryon from a single dead valve, sent to him by me from San Francisco. I obtained it from a miscellaneous collection of shells

from Japan, and have no reason to doubt but that the specimen came from Japan with the collection. Mr. Tryon has long held the belief that it was mixed with the others by accident, and that it was a California specimen. However that may be, I cannot tell; and we have, at present, no means of settling the question. The species is found in California in both a recent and fossil state, large valves being quite common in the Post-Pliocene of San Pedro; nevertheless I do not consider this any proof that it may not, likewise, be found living in Japan.

The individual figured is quite young, and is recent. It was kindly given to me by Mr. R. E. C. Stearns of San Francisco.

SILICUARIA, Schum.

? *S. EDENTULA*, n. s.

Pl. 15, Fig. 11.

SHELL moderately large, thin, flattened, elongated sub-elliptical, nearly equilateral; beaks minute, a little posterior to the middle, projecting almost insensibly beyond the cardinal line; cardinal margin sloping slightly and perfectly straight towards the two ends; anterior end convexly and very obliquely subtruncate above, produced and rounded below; posterior end broadly and regularly rounded, a little less prominent below than above the middle; basal margin nearly straight. Surface nearly smooth in the middle, marked by pretty distinct lines of growth towards the ends, especially above.

Length from beak to base, 1.3 inch; width, 2.6 inch; beak to anterior end, 1.45 inch. From the Pliocene of San Fernando.

On exposing the hinge of this shell, I was unable to get at the characters in a perfectly satisfactory manner, owing to its extreme thinness and delicacy. The teeth, if they exist, are very small, and seem to be almost entirely obsolete. It is possible that further examination will develop some characters of the hinge which will remove it entirely from the above genus, but I preferred placing it here provisionally, where it seems most nearly related, to proposing a new generic name on insufficient grounds.

CLIDOPHORA, Cpr.

C. PUNCTATA, Con. sp.

Pl. 15, Fig. 12.

*(Pandora punctata, Con. Jour. Phil. Acad., 1 S. Vol. 7, p. 228, pl. 17, fig. 1.)**(Clidophora punctata, Cpr. Proc. Zool. Soc., Lond., 1864, p. 598.)*

A shell having all the characters of this species in size, form, &c., except the punctations, was found by Mr. Samuel Peckham in the Upper Miocene bituminous shale, in the "Wheeler Cañon," near San Buenaventura. The valves are in contact, but the inner layer is in part exposed. The closest scrutiny on the outside of this layer fails to disclose the pits considered so characteristic of Mr. Conrad's species; nor do they show themselves on the marginal one-quarter of an inch of the inner surface which I have succeeded in uncovering.

HEMIMACTRA, Swains.

? H. OCCIDENTALIS, n. s.

Pl. 15, Fig. 13, 13 a.

SHELL thin, subovate, inequilateral; beaks small, closely approximating, placed about two-fifths of the length from the anterior end, which is broadly excavated above, and prominently, though narrowly rounded below; posterior end convexly and obliquely sub-truncated; cardinal margin sloping and nearly straight; base broadly and regularly convex; a moderately distinct angle runs from the beaks to the posterior basal margin. Surface covered by small but moderately prominent and pretty regularly placed lines of growth.

Length, 2.7 inch; width, 2.2 inch; diameter, 1.2 inch.

From the Miocene south of Martinez. Rare. A single specimen in my collection, obtained by Mr. Mathewson.

This shell resembles none of the West Coast *Mactroids* in form. It has not the extremely inequilateral and subcircular outline of the Miocene *lenticularis*, Nob., nor the trigonal shape of all the *Standellas*. I can only refer it provisionally to

Hemimactra, since, from the nature of the matrix, I have found it impossible to expose the hinge.

PSEUDOCARDIUM, Gabb.

By an unfortunate coincidence, Mr. Conrad indicated a genus *Pseudocardia*, of the family *Cardiidae* almost simultaneously with my publication of the above name. My genus was published February, 1866, while Mr. Conrad's appeared in the *Journal of Conchology* for April, 1866. It is questionable whether a name should stand when it only differs from an older one by the terminal letter, though Mr. C. assures me that he sees no reason for changing it. I merely wish to call attention to the matter here, in order to guard against confusion, which might possibly arise in the future. In this case Mr. Conrad publishes no semblance of a diagnosis, merely giving a list of species belonging to the proposed genus.

VENUS, L.

V. PERTENUIS, Gabb.

(*V. pertenuis*, G. Pal. Cal., Vol. 2, p. 22, pl. 5, fig. 37. Note.)

(*V. Kennerleyi*, Reeve ? G. loc. cit.)

When first studying this species, I was unacquainted with Reeve's *V. Kennerleyi*, and had not access to his monograph in *Icon. Conch.* The short notes by Carpenter in the Report of the British Association, were not inapplicable to the shell before me, but were not sufficiently explicit to enable me to satisfy myself as to its difference from *Kennerleyi*. On looking at the figure in *Icon. Conch.* I find that there are strong points of difference. *V. (Mercenaria) Kennerleyi* is an elongate, oval, almost quadrate shell, with heavy ribs, pretty regularly placed, and remarkably prominent. It resembles somewhat a *Saxidomus* in outline, while the present species is a sub-triangular shell, the surface undulated and striate, but without ribs, properly speaking. It is very probable that *pertenuis* may prove to be a *Chione*. I have never yet been able to expose the hinge. A large specimen of *Mercenaria perlammosa*, Con., now before me, resembles so nearly Reeve's figure in both outline and the character of the ribs, that I strongly suspect them of being identical. In the present specimen (see pl. 15, fig. 14), the ribs are not more than half as numerous as in the one figured in Pal. Cal., Vol. 2, fig. 38; the shell is more elongate in its antero-posterior diameter, and the base is much less rounded. On collecting a series of this species at Santa Barbara, where it is not rare, I found that the pres-

ent form is much more common than the short rounded one previously figured by me. It has a strongly characterized *Mercenaria* hinge, and is the only species of that genus yet known on the Pacific coast, unless Reeve's and Conrad's species should prove distinct.

CARYATIS, Roem.

C. BARBARENSIS, n. s.

Pl. 15, Fig. 15, 15 a.

SHELL rather small, transverse, gibbous, thin, inequilateral; beaks subcentral, small, strongly incurved, umbones prominent; outline broadly excavated under the beaks, the anterior end produced and narrowly rounded; posterior end narrow; base irregularly rounded, strongly curving upwards anteriorly; posterior cardinal margin sloping with a slight, but regular curve. Hinge delicate; teeth small. Surface covered by irregular striae of growth. Lunule very large, occupying all the space from the beaks to the anterior end, and bordered by an impressed line.

Length, 1.5 inch; width, 1.1 inch; height of a single valve, .4 inch.

The only shell on the coast, to which this has the most remote resemblance is the young of *Amiantis callosa* (*Cytherea id.* Con.) It can, however, be at once distinguished by its longer form, narrower at both ends, its greater convexity, its being much more deeply excavated under the beaks, and by the surface being marked only by lines of growth, instead of concentric ribs.

A single specimen was found in the Pliocene of Santa Barbara.

MERETRIX, Lam.

M. TRASKII, Con. sp.

(*Lutraria Traskii*, Con., P. R. R. Rep., Vol. 5, p. 324, pl. 3, fig. 23.)

This shell is peculiar to the white or Bituminous Shales of the Upper Miocene. It was described by Mr. Conrad from casts in this rock. I have been fortunate enough to see the cast of the hinge of both valves, and find that it is a *Venerid*, and appears to belong to the above genus. It is rather rare, but seems to be most abundant in the immediate vicinity of Monterey.

DOSINIA, Scopoli.

D. MATHEWSONII, n. s.

Pl. 15, Fig. 16.

SHELL nearly circular, excavated under the beaks, about the size of *D. Dunckerii*, but of nearly the form of *D. ponderosa*, convex, thin. Beaks small, pointing strongly forward. Surface nearly smooth in the middle, marked by lines of growth which become strongly developed towards the two ends. Lunule large, lanceolate and slightly impressed.

Length, 1.9 inch; width, 1.8 inch; height of one valve, .25 inch.

From the Miocene of Martinez; and at Griswold's, on the road from San Juan to New Idria.

With the outline of *Dosinia ponderosa*, and the peculiarity of its surface, this shell has about the average size of *D. Dunckerii*. It is more convex than either, much thinner than the first, and wants the rounded anterior prolongation and radiating lines of the other. The lunule is proportionally longer and more slender than either. It seems to be peculiar to the Miocene; *D. ponderosa* appearing, of full size, and for the first time, in the Pliocene. The other species has not been found fossil in California.

TAPES, Megerle.

T. STALEYI, Gabb.

Pl. 16, Fig. 17, 17 a.

(*Dosinia id.*, G. Pal. Cal., Vol. 2, p. 24.)

(*Tapes id.*, G. Pal. Cal., Vol. 2, pl. 7, fig. 42.)

A single worn specimen, from which this species was originally described, deceived me as to some of its characters. It has a true *Tapes* hinge, and the surface is crossed by very numerous, minute radiating ribs. It is not unfrequently a little larger than the specimen figured; the pallial sinus is very deep, and rather narrow.

The ribs are of the same character as those of *T. straminea*, but are at least four times as numerous as the most finely costate varieties of that species that I have ever seen.

SAXIDOMUS, Con.

S. GIBBOSUS, n. s.Pl. 16, Fig. 18, *a*, *b*.

SHELL thin, subquadrate, very inequilateral; beaks anterior, nearly terminal; anterior end excavated above, narrowly rounded below; posterior end convexly subtruncated, sometimes a little oblique; base broadly rounded; cardinal margin gently sloping and slightly convex. Surface marked by small but distinct and somewhat irregular lines of growth. Lunule large, bordered by a very fine impressed line. Hinge, teeth slender.

Dimensions of two extreme specimens: 1st. Length, 2.3 inch; width, 1.7 inch; diameter of two valves, 1.3 inch; 2d. Length, 2 inch; width, 1.7 inch; diameter, 1.2 inch.

Common in the Pliocene of Eagle Prairie, Humboldt County.

Resembles in outline *S. Nuttallii* and *S. gracilis* (= *aratus*), but can be at once distinguished by its smaller size, more gibbous form, smoother surface, and thinner shell.

YOLDIA, Möll.

Y. NASUTA, Gabb.

(*Yoldia nasuta*, G. Pal. Cal., Vol. 1, p. 216, pl. 32, fig. 287.)

This shell, described from a single specimen in the Museum of the Cal. Acad. Nat. Sci., has since proven to be undoubtedly Tertiary; and although the matrix is not unlike some of the Miocene Shale, underlying the City of Los Angeles, as cut by artesian borings, it seems to me more like the Post-Pliocene deposit near San Pedro. The specimen is labelled "Los Angeles," and its history is entirely unknown. Its lithological characters place it outside of all the known Cretaceous, so that I have little hesitation in making the unqualified statement above.

Y. IMPRESSA, Con., sp.

(*Nucula impressa*, Con.; Wilkes's Exped., p. 726, pl. 18, fig. 7.)

(*Yoldia id.*, Meek; Check List, Miocene.)

(*Y. Cooperii*, G.; Proc. Cal. Acad., 1865, p. 189.)

(*Id.*, G.; Pal. Cal., Vol. 2, p. 31, pl. 9, fig. 54.)

(*Id.*, Cooper and Carpenter; Enumerations of W. C. Moll.)

I described this magnificent species from a single recent valve, and numerous fossils in all the deposits down to the Miocene; and in doing so I was supported in my opinion of its being a nondescript by no less authorities than Cooper and Carpenter, who had been working for years in the mollusca of California, and by Hanley, who had just completed a monograph of the family. More recently, while preparing the following table of synonymy, I have been convinced that Conrad's *impressa* is merely a young of the same species. My reasons are: first, there is nothing incompatible in the form; second, the sculpture of the surface, so far as figured in the Wilkes's Exped. Report, is the same as that of *Cooperii*; and third, I have seen an undoubted specimen of my species from the Miocene of Astoria.

PECTEN, Brug.

P. PECKHAMI, n. s.

Pl. 16, Fig. 19 *a*.

SHELL small, thin, subcircular, equivalve, or nearly so, slightly inequilateral; ears nearly equal in size. Upper valve, right ear not separated by any distinct line from the remainder of the surface; the corresponding ear of the lower valve has the same character; left ear flat, the swell of the shell commencing with nearly a right angle with its surface; corresponding ear of lower valves produced, separated from the body of the shell by a marked groove and a deep, narrow sinus. Surface marked by numerous small, irregular, concentric undulations, crossed by obsolete wavy radiating lines, which are most distinct on the ears.

From the bituminous shales of the Upper Miocene, on the Ojai Ranch, Santa Barbara County, where numerous specimens were collected by Mr. S. F. Peckham.

Also found in the same formation on the shores of San Pablo Bay, west of Martinez, and elsewhere.

Dimensions of various specimens: Length, .55 inch; width, .52 inch.

“ .49 inch; “ .47 inch.

“ .6 inch; “ .57 inch.

Average depth of valve, .06 to .07 inch.

This shell belongs to the group (genus ?) *Camptonectes*, Agas., characterized by a lenticular form, closed all round, edentulous hinge, deep byssal sinus, and the minute radiating sculpture. The species is named after Mr. Peckham, in recognition of his valuable services rendered in collecting the fossils found in the vicinity of the Ojai Ranch.

P. PEDROANUS, Trask, sp.

(*Plagiostoma Pedroana*, Trask; Proc. Cal. Acad., 1856, p. 86, pl. 3, fig. 1.)

(*P. annulata*, Trask; loc. cit., p. 86, pl. 3, fig. 2.)

(*P. truncata*, Trask; loc. cit., p. 86, pl. 3, fig. 3.)

In 1856, Dr. Trask named three species of *Plagiostoma*, giving full descriptions and well-executed figures as above. His specimens are casts of a number of distorted *Pectens*, perhaps normally a little oblique, but in most cases with the obliquity exaggerated by pressure. They belong, without question, to but one species, and the first name given will have to be retained. I have carefully studied the specimens, and have visited the locality from which they were obtained. The deposit belongs to the bituminous shale of the Upper Miocene, which underlies the whole or the greater part of the Los Angeles plain, crops out on the beach at San Pedro, under the Post-Pliocene, and has been reached by artesian borings under the city itself.

The species is about an inch in diameter, ears subequal, shell thin, perhaps normally a little oblique, and the shell-substance contains a few concentric undulations or ribs, which are retained in the cast. No specimens show any shell preserved; so that, if there was any surface sculpture, it is, as yet, unknown.

OSTREA, Linn.

O. VEATCHII, Gabb.

Pl. 17, Fig. 21, 21 a.

(*O. Veatchii*, Gabb; Pal. Cal., Vol. 2, p. 34, pl. 11, fig. 59.)

This shell was originally described from Cerros Island, whence it was brought by Dr. Veatch. I have since found it, forming whole beds of Post-Pliocene age,

near the port of San Bruno and vicinity, north of Loreto, on the east side of the Peninsula of Lower California. At this locality, most of the specimens are six inches or more in diameter, very thick, and quite flat, the ribs being much more numerous, and somewhat smaller than in the specimens from which my original description and figure were taken.

O. Cerrosensis was found associated with it at San Bruno, and I have recently received from Prof. Raimondi, of Lima, a shell from the Post-Pliocene of Peru, which seems to be identical with the latter species.

TAMIOSOMA, Conrad.

T. GREGARIA, Con.

Pl. 18, Fig. 22, *a, b, c, d.*

(*Tamiosoma gregaria*, Con. ; Proc. Phil. Acad., 1856, p. 315.)

(*Tamiosoma gregaria*, Con. ; P. R. R. Rep., Vol. 6, p. 72, pl. 4, fig. 18.)

(*Balanus Estrellanus*, Con. ; P. R. R. Rep., Vol. 7, p. 195, pl. 8, fig. 1.)

(*Radiolites gregaria*. Con. ; Proc. Phil. Acad., 1864, p. 214.)

This problematical fossil was described by Mr. Conrad almost simultaneously in the Proceedings of the Philada. Acad. Nat. Sciences, and in the sixth volume of the Pacific Railroad Reports, as follows: "An elongated tube, apparently entire, porous and cellular throughout its substance; interior filled with numerous regularly disposed vaulted cells, connected by longitudinal slender tubes, funnel-shaped beneath; aperture resembling that of *Balanus*."

"*T. gregaria*. Subquadrangular, elongated, longitudinally furrowed and striate, and having fine, undulated, transverse lines; mouth small, oblique; upper part of the tube oblique, deeply indented or Balaniform, and coarsely striated longitudinally. Length, eight inches." He further remarks: "Growing in clusters, like *Balanus*. No sutures indicating separate valves; cells very thin plates, convex surface downwards."

From the above, it seems either that Mr. Conrad had no opinion as to the relations of this shell; or from his repeated comparisons with *Balanus*, that he appeared to have suspected it of being a *Cirrhipede*; and he accidentally redescribed it as such, in the seventh volume of the P. R. R. Reports.

In 1864, however, in the course of some "rectifications," he quotes it as a *Radiolite*, without other remarks than that it is characteristic of the Cretaceous of California.

Though since found at a number of localities in the State, it seems to be always rare. I had not the good fortune to encounter it, until in the summer of 1866,

when I obtained specimens from Estrella, whence Mr. Conrad described his "*Balanus Estrellanus*," and later, Mr. Gibbes, a surveyor, presented me with a remarkably fine example from the hills north of Buena Vista Lake. The original specimen, figured in Vol. 6, Pacific R. R. Rep., came from the Santa Margarita Ranch, northeast of San Luis Obispo. These localities serve to fix its geological age beyond question as belonging in the Bituminous Shale, the best-marked member of our Upper Miocene. This being ascertained, the next point is to determine what are its relations.

To better understand the shell, it may be well to premise by remarking that Mr. Conrad mistook the two ends of his specimen, and called the base, the aperture. The following description, in the absence of more than one species, will have to serve for both generic and specific purposes, since in so exceptional a case it is difficult to determine which of the minor characters are of only specific value.

Shell (? lower valve) elongated, cup-shaped, growing in clusters, cemented throughout the entire length wherever in contact; cross-sections irregularly rounded or angulated; lower end of each shell curved outwards, to accommodate the increased diameter of its neighbors; walls of the cup composed of (two, or) three layers. (I have not been able to determine finally, whether an outer impervious layer exists, though I think I have detected it in the Estrella specimens.) The mass of the wall is composed of a series of sub-parallel, longitudinal hollow tubes, rudely and irregularly divided by minute septa; inner layer entire, homogeneous, and thin. The interior contains a "body chamber," or large unoccupied space, at its widest end, below which the cavity is filled up by an indefinite number of very irregular septa, undulated, and presenting a mammillated surface upwards. These septa are produced by lateral prolongations of the inner wall, the "funnel-shaped tubes," mentioned in Mr. Conrad's diagnosis, being the portions last formed as the mantle was retracted. Some of these "tubes" reach to the surface of the preceding septum, while many of them are merely little stalactite-like points, and it is doubtful whether any of them are perforate. In the specimen from which the first description was taken, these chambers and even the tubes of the outer walls are all hollow. In the others they are filled with crystalline carbonate of lime; and in these latter, the outer, or "body chambers," are filled with an indurated sand. The outer surface is rudely and longitudinally striate; the striæ are sometimes crossed by abrupt transverse breaks or subsquamose lines.

The thickness of the outer wall is a quarter of an inch or less, the tubules composing it being about .04 inch in diameter; the inner stratum of the wall is about .01 to .02 inch in thickness.

I have used the term "lower valve," because I believe this to be a bivalve shell, for the reasons given below. The upper valve, if it existed, has never yet been detected; but, if my view is correct, this need not be wondered at, especially since fossils are rare in the deposit in which the shell belongs; and with all the facilities

of the Geological Survey of the State to help me, I was four years before I could obtain a single specimen.

I am convinced that *Tamiosoma* is a genus of *Hippuritidæ*, for the following reasons:

1st. The form of the shell, the septate lower portion of its cavity, the longitudinally tubular walls, and the chamber at the top, for the reception of the animal, are characters which are found combined only in this family.

2d. Its mode of growth is exactly analogous to that of the genera *Hippurites* and *Radiolites*.

3d. The structure of its walls is identical with that of *Radiolites*; differing only in the relative thickness, as compared with the size of the interior cavity. This analogy is carried out even to the extent of the prisms or columns, which constitute the greater bulk of the walls, and are longitudinal and normally hollow, instead of being transverse and solid as in *Inoceramus* and *Pinna*.

4th. The septate arrangement of the lower part of the interior cavity is analogous to that existing in *Radiolites*, as demonstrated by Woodward in the case of *R. Mortoni*; the septa in that species differing only in being much less numerous, and a little more symmetrical than in our fossil. (See Woodward, Quart. Jour. Geol. Soc., Lond., Vol. XI, pl. 5, fig. 2.)

The only arguments that I can find against my position are: 1st. This shell is Tertiary, and the *Hippuritidæ* are all Cretaceous. Although this would be doubtless the first objection urged, I can only see in it a reason against *à priori* arguments on negative grounds, too common in science. Because the family has never heretofore been found outside of the Cretaceous formation, is no reason why its vertical range may not be extended by discoveries now or hereafter.

2d. The thinness of the walls of the shell, as compared with *Radiolites*, which I have called its nearest ally.

So long as the details of the structure are preserved, this cannot be a valid objection.

3d. No trace has yet been found of ligament insertions, nor of the enormous hinge teeth characteristic of the family. But, as yet, no specimen has been found showing the entire shell, and the thinness of the walls warrants us, by analogy, in predicating a delicate hinge when that portion shall be discovered.

PALÆONTOLOGY OF CALIFORNIA.

VOL. II.

SECTION I.

TERTIARY INVERTEBRATE FOSSILS.

PART III.

SYNOPSIS OF THE TERTIARY INVERTEBRATE FOSSILS OF CALIFORNIA.

SYNOPSIS
OF
THE INVERTEBRATE FOSSILS
OF THE
TERTIARY FORMATIONS OF CALIFORNIA.

IN the following synopsis I have included all the species of Tertiary fossils described from the West Coast, which have been encountered during the progress of the Geological Survey, either in California or in the adjoining State of Oregon. This is indispensable, on account of the intimate relations existing between the Tertiaries of the two States.

The species which have been named, but not recognized or rediscovered, are appended as a separate list at the end. Of the latter, some will doubtless yet be encountered, though the great majority seem to be hopelessly lost. In many cases I have been able to discover what was meant by a description in the Pacific Railroad Reports, only by going to the typical locality, and by that familiarity with the forms, which can only be acquired by years of intimate acquaintance and the study of series of specimens such as amateurs rarely have the good fortune to accumulate. With the double advantage of all the facilities that a government commission could afford, and of half a lifetime of acquaintance with the peculiarities of the author's method of working, I have failed in many cases to make out what was intended by the meagre descriptions, and illustrations bad beyond precedent, which are found in the Reports of the Pacific Railroad explorations.

From the length of time that has elapsed since the publication of these volumes, the author of the Tertiary Palæontology, which they contain, has in most cases forgotten his own species, and has repeatedly declared his inability to assist me; the originals of the descriptions are inaccessible, packed away with the great bulk of the government collections in the cellars of the Smithsonian Institution, and I have been obliged to trust almost entirely to my own acquaintance with the subject, in unravelling the tangled skein of the synonymy of the West Coast Tertiaries.

Under these circumstances, therefore, it will be surprising if I have succeeded, in every instance, in correcting the names of the species; and, doubtless, differences of opinion will always exist in many cases. I have, however, endeavored conscientiously to work out the problem before me, and, should my labors provoke criticism, my only reply shall be—Go thou and do better. In determination of the living forms, I must acknowledge particular indebtedness to Dr. J. G. COOPER, of the Survey, and Dr. P. P. CARPENTER, of Montreal. The latter gentleman has gone over nearly all of the recent mollusca collected by the Survey; and West Coast conchologists depend to a great extent on his opinions, based as they are on a most extensive acquaintance with the subject.

CRUSTACEA.

CANCER, Linn. C. BREWERII, Gabb.

C. Brewerii, Gabb; Pal. Cal., Vol. 2, p. 1, pl. 1, fig. 1.
Pliocene, Santa Barbara.

MOLLUSCA.

ATURIA, Bronn. A. ZICZAC, Sby. sp.

A. ziczac, Con.; Jour. Conchology, 1865. No. 1.
Nautilus ziczac, Sby.; Min. Conch., Vol. 1, p. 12, pl. 1.
N. angustatus, Con.; Wilkes's Exped., p. 728, pl. 20, fig. 56.
Pelagus Vanuxemi, Con.; Jour. Acad. Phila., 2d Ser., Vol. 1, p. 130, pl. 14,
fig. 5.
Aturia Vanuxemi, Con.; Smithsonian Check List, No. 639.
Miocene, Astoria.

TRIPTERA, Quoy and Gaim. T. CLAVATA, Gabb.

T. clavata, Gabb; Pal. Cal., Vol. 2, p. 1, pl. 1, fig. 2.
Miocene, near Griswold's, on the road from San Juan to the New Idria mines,
associated with *Dosinia Mathewsonii*, *Arca microdonta*, *Acila Castrensis*, and
various other characteristic species.

MURICIDEA, Swains. M. CALIFORNICA, Hds. sp.

Murex Californicus, Hds.; Proc. Zool. Soc., 1863, p. 128.
Muricidea id., Cpr.; Brit. Assn. Rep., 1863, p. 663.
Post-Pliocene, Santa Barbara. Living.

M. (PHYLLONOTUS?) PAUCIVARICATA, Gabb.

Muricidea (Phyllonotus?) paucivaricata, Gabb; Pal. Cal., Vol. 2, p. 43, pl. 14,
fig. 1.
Post-Pliocene, S. Barbara, S. Pedro, S. Diego.

M. BARBARENSIS, Gabb.

M. Barbarensis, Gabb; Proc. Cal. A. N. S.
Post-Pliocene, Santa Barbara. Living.

PTERONOTUS, Swains. *P. FESTIVUS*, Hds. sp.

Murex festivus, Hinds ; Proc. Zool. Soc., 1843, p. 127.

Id., Hds. ; Voyage of the Sulphur, p. 9, pl. 3, fig. 13, 14.

Pteronotus festivus, Cpr. ; Brit. Assn. Rep., 1863, p. 663.

Post-Pliocene, S. Diego. Living.

OCINEBRA, Leach. *O. INTERFOSSA*, Cpr.

Ocenebra interfossa, Cpr. ; Brit. Assn. Rep., 1863, p. 663.

Post-Pliocene, Santa Barbara. Living.

O. LURIDA, Midd. sp.

Tritonium luridum, Midd. ; Mal. Ross., pt. 2, p. 150, pl. 4, fig. 4 and 5.

Ocenebra lurida, Cpr. ; Brit. Assn. Rep., 1863, p. 663.

Post-Pliocene, S. Pedro. Living.

TROPHON, Montf. *T. PONDEROSUM*, Gabb.

T. ponderosum, Gabb ; Pal. Cal., Vol. 2, p. 2, pl. 1, fig. 3.

Miocene, Griswold's and Walnut Creek, Contra Costa Co. ; Pliocene, Kirker's Pass.

T. SQUAMULIFER, Cpr.

Id., Cpr. ; Pal. Cal., Vol. 2, p. 44.

Post-Pliocene, Sta. Barbara. Living.

T. MULTICOSTATUS, Esch. sp.

Trophon multicostatus, H. and A. Ad. ; Gen. R. Moll., Vol. 1, p. 77.

Murex multicostatus, Esch. ; Zool. Atl., p. 11.

Polyplex gracilis, Perry ; Conchology, pl. 9, fig. 4.

Post-Pliocene, Santa Barbara. Living.

T. ORPHEUS, Gld. sp.

Fusus Orpheus, Gld. ; Proc. Boston Nat. Hist. Soc., 1849, p. 142.

Id., Gld. ; Wilkes's Exped., p. 234, pl. 16, fig. 285.

Trophon Orpheus, Cpr. ; Brit. Assn. Rep., 1863, p. 663.

Post-Pliocene, Santa Barbara. Living.

T. TENUISCULPTUS, Cpr.

Trophon tenuisculptus, Cpr. ; An. & Mag. Nat. Hist., 1866, p. 227.

Post-Pliocene, Santa Barbara. Living.

FUSUS. F. AMBUSTUS, Gld.

F. ambustus, Gld.; Mex. and Cal. Shells, p. 12, pl. 14, fig. 18.

Id., Cpr.; Proc. Zool. Soc., 1856, p. 208.

Post-Pliocene, Santa Barbara, S. Pedro. Living.

NEPTUNEA, Bolt. N. RECURVA, Gabb.

N. recurva, Gabb; Pal. Cal., Vol. 2, p. 3, pl. 1, fig. 4.

This shell belongs apparently to the more recent members of the Miocene, being found near Tomales Bay, Griswold's, El Toro Rancho, and at Foxin's, in Santa Barbara County. At the latter place the beds overlie the bituminous shale, and appear to be almost a connecting link with the Pliocene.

N. TABULATA, Baird, sp.

Chrysodomus tabulatus, Baird; Proc. Zool. Soc., 1863, p. 66.

Chrysodomus tabulatus, Cpr.; Brit. Assn. Rep., 1863, p. 663.

C. tabulatus, Cooper; Survey Check List.

Pliocene, Santa Barbara, San Fernando, and at the Twelve-mile House, below San Francisco; Post-Pliocene, Santa Barbara, and San Pedro. Living.

N. ALTISPIRA, Gabb.

Id., Gabb; Pal. Cal., Vol. 2, p. 44, pl. 14, fig. 2.

Pliocene, Eagle Prairie, Humboldt County

N. HUMEROSA, Gabb.

Id., Gabb; Pal. Cal., Vol. 2, p. 45, pl. 14, fig. 3.

Pliocene, S. Fernando.

PRISCOFUSUS, Conrad.

This genus was merely indicated by Mr. Conrad in the Journal of Conchology, to accommodate the following species. No diagnosis has ever been published.

P. GENICULUS, Con.

Fusus geniculus, Con.; Wilkes's Exped., p. 728, pl. 20, fig. 3.

Priscofusus id., Con.; Jour. Conch., 1865, p. 150.

Miocene, Astoria. Living.

NOTE.—Several other species will be found in the list of unrecognized forms

METULA, H. & A. Ad. M. REMONDI, Gabb.

M. Remondi, Gabb; Pal. Cal., Vol. 2, p. 3, pl. 1, fig. 5.

Miocene, Tomales.

AGASOMA, Gabb. A. GRAVIDA, Gabb.

Clavella gravida, Gabb; Pal. Cal., Vol. 2, p. 4, pl. 1, fig. 6.

Indet., Con.; P. R. R. Rep., Vol. 5, pl. 7, fig. 63.

Agasoma gravida, Gabb; *supra*, p. 46.

Miocene, near Martinez, and at Ocoya Creek.

A. SINUATA, Gabb.

Clavella sinuata, Gabb; Pal. Cal., Vol. 2, p. 5, pl. 1, fig. 7.

Agasoma sinuata, Gabb; *supra*, p. 46.

Miocene, Walnut Creek, Contra Costa County.

PISANIA, Bivona. P. FORTIS, Cpr.

Pisania fortis, Cpr.; An. & Mag. Nat. Hist., 1866, p. 227.

Post-Pliocene, Santa Barbara.

SURCULA, H. and A. Ad. S. CARPENTERIANA, Gabb.

Pleurotoma (Surcula) Carpenteriana, Gabb; Proc. Cal. A. N. S., 1865, p. 183

Id., Gabb; Pal. Cal., Vol. 2, p. 5, pl. 1, fig. 8.

Pliocene, S. Fernando, Santa Rosa; Post-Pliocene, Santa Barbara, San Pedro
Living.

S. TRYONIANA, Gabb.

P. (S.) Tryoniana, Gabb; Pal. Cal., Vol. 2, p. 6, pl. 1, fig. 9.

Post-Pliocene, S. Pedro. Living.

DRILLIA, Gray. D. INERMIS, Hds. Sp.

Pleurotoma inermis, Hds.; Proc. Zool. Soc., 1843, p. 37.

Id., Hds.; Voy. Sulphur, p. 16, pl. 5, fig. 8.

Drillia inermis, Cpr.; Brit. Assn. Rep., 1863, p. 657.

Post-Pliocene, S. Pedro. Living.

D. PERVERSA, Gabb.

Pleurotoma perversa, Gabb; Proc. Cal. A. N. S., 1865, p. 183.

Id., Gabb; Pal. Cal., vol. 2, p. 6, pl. 1, fig. 10.

Post-Pliocene, Sta. Barbara, S. Pedro. Living.

D. VOYI, Gabb.

D. Voyi, Gabb; Pal. Cal., vol. 2, p. 7, pl. 1, fig. 11.

Pliocene, Humboldt County, at Eagle Prairie and Bear R.

CLATHURELLA, Cpr. **C. CONRADIANA**, Gabb.

C. Conradiana, Gabb; Pal. Cal., vol. 2, p. 7, pl. 1, fig. 12.

Post-Pliocene, Santa Barbara. Living.

MANGELIA, Leach. **M. VARIEGATA**, Cpr.

Mangelia variegata, Cpr.; Brit. Assn. Rep., 1863, p. 658

Post-Pliocene, Santa Barbara. Living.

TRITONIUM, Link. (*S. G. Priene*, H. and A. Ad.) **T. (P.) OREGONENSIS**, Redf. sp.

Triton Oregonensis, Redfield; A. N. Y. Lyc., vol. 4, p. 165.

Id., Gld.; Wilkes's Exped., p. 241.

Fusus Oregonensis, Rve.; Icon. Conch., No. 61.

F. cancellatus, Rve.; Loc. cit., No. 62.

T. (Priene) Oregonensis, Cpr.; Rep. W. C. Moll., Brit. Assn., p. 583.

Post-Pliocene, Santa Barbara. Living.

RANELLA, Lam. ? **R. TRIQUETRA**, Cpr.

R. triquetra, Cpr.; ("teste Nutt. MSS."), P. Zool. Soc., 1856, p. 227.

Post-Pliocene, San Diego. Living.

R. CALIFORNICA, Hds.

R. Californica, Hds.; Ann. Mag. Nat. Hist., vol. 2, p. 255.

R. Californica, Hds.; Voy. Sulphur, p. 12, pl. 2, fig. 4 and 5.

Pliocene, Kirker's Pass; Post-Pliocene, Santa Barbara, San Pedro. Living.

R. MATHEWSONII, Gabb.

R. Mathewsonii, Gabb; Pal. Cal., vol. 2, p. 8, pl. 2, fig. 13.
Miocene, near Martinez.

COMINELLA, Gray. (*S. G. Amphissa*, H. and A. Ad.) C. (A.) COR-
RUGATA, Rve. sp.

Buccinum corrugatum, Rve.; Icon. Conch., pl. 14, fig. 110.
Truncaria corrugata, Cpr.; Brit. Assn. Rep., 1863, p. 662.
Cominella (*Amphissa*) *corrugata*, Cpr.; Brit. Assn. Rep., 1866.
Post-Pliocene, San Pedro, Santa Barbara. Living.

NASSA, Lam. N. TEGULA, Rve.

Nassa tegula, Rve.; Icon. Conch., Nassa, No. 98, pl. 15.
Post-Pliocene, Santa Barbara, San Pedro. Living.

N. MENDICA, Gld.

N. mendica, Gld.; Proc. Bost. N. H. Soc., 1850, p. 155.
N. mendica, Gld.; Wilkes's Exped., p. 263, pl. 19, fig. 331.
Post-Pliocene, Santa Barbara, San Pedro. Living

N. COOPERII, Fbs.

N. Cooperii, Forbes; Zool. Proc., Lond., 1850, p. 273, pl. 11, fig. 4.
Post-Pliocene, Santa Barbara, San Pedro. Living. Erroneously described
as from the Sandwich Islands.

N. FOSSATA, Gld. sp.

Buccinum fossatum, Gld.; Proc. B. N. H. Soc., 1850, p. 152.
Nassa id., H. and A. Ad.; Gen. Recent Mollusca.
B. elegans, Rve.; Proc. Zool. Soc., 1842.
Schizopyga Californica, Con.; P. R. R. Rep., vol. 6, p. 69, pl. 2, fig. 1.
Miocene, Martinez, Griswold's, Walnut Creek, Foxin's, Maxima Martinez
Rancho; Pliocene, San Fernando, near San Francisco, Santa Rosa, and
Russian R. Valley; Post-Pliocene, Santa Barbara, San Pedro, and San
Diego. Living.

N. PERPINGUIS, Hds.

N. perpinguis, Hds. ; Voy. Sulphur, p. 36, pl. 9, fig. 12, 13.

N. interstriata, Con. ; P. R. R. Rep., Vol. 5, p. 327, pl. 6, fig. 49.

Pliocene, San Fernando; Post-Pliocene, San Pedro, Santa Barbara. Living.

PURPURA, Brug. P. SAXICOLA, Val.

P. saxicola, Val. ; Voy. Venus, pl. 8, fig. 4.

P. canaliculata, Ducl. ; An. N. Sc., 1832, p. 104, pl. 1, fig. 1.

P. ostrina, Gld. ; Otia, p. 225.

P. lapillus, Coop. ; (not Linn. sp., Lam.), N. Hist. Washn. Terr., p. 372.

P. attenuata, Rve. ; Icon. Conch., pl. 10, fig. 49.

P. emarginata, Desh. ; (not Rve.), Mag. de Zool., 1841, pl. 25.

Pliocene, Santa Rosa, Kirker's Pass, San Fernando; Post-Pliocene, Santa Barbara. Living.

MONOCERAS, Lam. M. LUGUBRIS, Sby.

Monoceras lugubris, Sby. ; Genera, No. 5, fig. 3.

Post-Pliocene, Santa Barbara Island. Living.

M. ENGONATUM, Con.

M. engonatum, Con. ; Jour. Phil. Acad., 1 Ser., Vol. 7, p. 264, pl. 20, fig. 17.

M. unicarinatum, Rve. ; Icon. Conch., sp. 1.

Post-Pliocene, San Pedro. Living.

CUMA, Humph. C. BIPPLICATA, Gabb.

C. biplicata, Gabb ; Pal. Cal., Vol. 2, p. 9, pl. 2, fig. 14.

Miocene, Martinez.

OLIVELLA, Swains. O. BIPPLICATA, Sby. sp.

Oliva biplicata, Sby. ; Tank. Cat., App., p. 33.

Olivella biplicata, Cpr. ; B. A. Rep., 1863, p. 661 ; H. & A. Ad. ; Gen., p. 146.

Post-Pliocene, Santa Barbara, San Pedro, San Diego. Living.

O. PEDROANA, Con. sp.

Strephona Pedroana, Con. ; P. R. R. Rep., Vol. 5, p. 327, pl. 6, fig. 51.

Olivella baetica, Cpr. ; B. A. Rep., 1863, p. 661.

Post-Pliocene, Santa Barbara, San Pedro. Living.

ANCILLARIA, Lam. A. **FISHII**, Gabb.

A. Fishii, Gabb; Pal. Cal., Vol. 2, p. 9, pl. 2, fig. 15.
Miocene, Martinez.

VOLUTILITHES, Swains. "V. **INDURATA**," Con.

Rostellaria indurata, Con.; Wilkes's Exped., p. 727, pl. 19, fig. 12.

Volutilithes id., Con.; Jour. Conch., 1865, p. 151.

Miocene, Oregon, Tomales Bay, Cal.; Pliocene, Half-Moon Bay.

This shell is found occasionally, though rarely. I have seen several specimens, but never in a sufficiently good condition to determine fully its generic relations. That it is not a *Rostellaria*, nor in fact one of the *Strombidæ*, is sufficiently evident from its form. I have never been able to detect even the rudiments of folds on its columella, which fact, together with its non-cancellate surface, carry it out of the other genus in which Mr. Conrad has placed it. It will probably be found, when we obtain better specimens, to belong to the *Fusinæ*.

COLUMBELLA, Lam. C. (**ALIA**) **RICHTHOFFENI**, Gabb.

C. (Alia) Richthofeni, Gabb; Pal. Cal., Vol. 2, p. 10, pl. 2, fig. 16.
Pliocene, Russ. R., San Fernando, and San Francisco.

AMYCLA, H. & A. Ad. A. **GAUSAPATA**, Gld. sp.

Columbella gausapata, Gld.; Proc. Bost. N. H. Soc., 1850, p. 170.

Id., Gld.; Wilkes's Exped., p. 267, pl. 19, fig. 337.

Amycla id., Cpr.; Brit. Assn. Rep., 1863, p. 662.

Nassa Pedroana, Con.; P. R. R. Rep., Vol. 5, p. 327, pl. 6, fig. 48.

Post-Pliocene, Santa Barbara, San Pedro. Living.

A. **CARINATA**, Hds. sp.

Columbella carinata, Hds.; Voy. Sulphur, p. 39, pl. 10, fig. 15, 16.

Columbella carinata, Cpr.; ("perhaps *Amycla*,") Br. A. Rep. 1863, p. 662.

Post-Pliocene, Santa Barbara. Living.

MARGINELLA, Lam. M. **JEWETTI**, Cpr.

M. Jewetti, Cpr.; P. Zool. Soc., 1856, p. 207.

Post-Pliocene, San Pedro. Living.

FICUS, Bolt. **F. PYRIFORMIS**, Gabb.

F. pyriformis, Gabb; Pal. Cal., Vol. 2, p. 48, pl. 14, fig. 4.
Miocene, Martinez.

F. NODIFERUS, Gabb.

F. nodiferus, Gabb; Pal. Cal., Vol. 2, p. 48, pl. 14, fig. 5.
Miocene, Griswold's; Pliocene, San Fernando.

NATICA, Brug. **N. CLAUSA**, Brod. & Sby.

N. clausa, Brod. & Sby.; Zool. Beechey's Voy., p. 136, pl. 34, fig. 3; and pl. 37, fig. 6.
Post-Pliocene, Santa Barbara and San Pedro. Living.

LUNATIA, Gray. **L. LEWISII**, Gld., sp.

Natica Lewisii, Gld.; Proc. Bost. N. Hist. Soc., 1847, p. 239.
N. Lewisii, Gld.; Wilkes's Exped., p. 211, pl. 15, fig. 253.
Natica Herculea, Midd.; Mal. Ross., Part 2, p. 96.
Lunatia Lewisii, Cpr.; B. A. Rep., 1863, p. 661.
Pliocene, Santa Barbara, San Fernando, Kirker's Pass; Post-Pliocene, Santa Barbara, San Pedro, San Nicholas Isd. Living.

NEVERITA, Risso. **N. SAXEA**, Con.

Neverita saxea, Con.; Jour. Conch., 1865, p. 151.
Natica saxea, Con.; Wilkes's Exped., p. 727, pl. 19, fig. 7.
Miocene, Oregon.

N. CALLOSA, Gabb.

N. callosa, Gabb; Pal. Cal., Vol. 2, p. 10, pl. 2, fig. 17, a, b, c.
Miocene, Walnut Creek

N. RECLUZIANA, Desh., sp.

Natica Recluziana; Desh.; Mag. de Zool., 1841, Mollusca, pl. 37.
Neverita Recluziana, H. & A. Ad.; Gen. Rec. Moll., Vol. 1, p. 208.
Natica Inezana, Con.; P. R. R. Rep., Vol. 7, p. 195, pl. 10, fig. 5, 6.
Natica Ocoyana, Con.; P. R. R. Rep., Vol. 5, p. 328, pl. 7, fig. 57.
Miocene, Santa Inez Mts., Walnut Creek, Pose Creek, Martinez, Death Valley; Pliocene, Santa Barbara, San Fernando; Post-Pliocene, Santa Barbara, San Pedro. Living.

SINUM, Bolt. *Sigaretus*, Lam. S. PLANICOSTUM, Gabb.

S. planicostum, Gabb.; Pal. Cal., Vol. 2, p. 49, pl. 14, fig. 6.
Pliocene, San Fernando.

SCALARIA, Lam. S. SUBCORONATA, Cpr.

Scalaria subcoronata, Cpr.; B. A. Rep., 1863, p. 660.
Post-Pliocene, Santa Barbara. Living.

S. CREBRICOSTATA, Cpr.

Scalaria crebricostata, Cpr.; *Loc. cit.*, p. 660.
Post-Pliocene, San Pedro. Living.

S. BELLASTRIATA, Cpr.

Scalaria bellastriata, Cpr.; *Loc. cit.*, p. 660.
Post-Pliocene, Santa Barbara. Living.

OPALIA, H. & A. Ad. O. (CRENATOIDES, var.) INSCULPTA, Cpr.

Opalia (crenatoides, var.) insculpta, Cpr.; An. Mag. Nat. Hist., 1866, p. 277.
Post-Pliocene, Santa Barbara.

MYURELLA, Hds. M. SIMPLEX, Cpr.

Myurella simplex, Cpr.; B. A. Rep., West Coast Moll., 1863, p. 657.
Post-Pliocene, Santa Barbara, San Pedro. Living.

CONUS, Linn. C. CALIFORNICUS, Hds.

C. Californicus, Hinds; Voy. Sulphur, p. 7, pl. 1, fig. 3, 4, 5.
C. ravus, Gld.; Shells of Mex. and Cal., p. 13, pl. 14, fig. 20.
C. ravus, Cpr.; Proc. Zool. Soc., Lond., 1856, p. 206.
Pliocene, San Fernando; Post-Pliocene, San Diego, San Pedro, and Santa Barbara. Living.

CYPRÆA, Linn. (S. Gen. *Luponia*, Gray.) C. (L.) SPADICEA, Swains.

Cypræa spadicea, Swainson; Phil. Mag., Vol. 61, p. 370; Zool. Ill., pl. 182.
Luponia spadicea, Gray; Cpr.; B. A. Rep., p. 657.
Post-Pliocene, Santa Barbara Isd. Living.

CANCELLARIA, Lam. C. (EUCLIA) TRITONIDEA, Gabb.

C. (Euclia) tritonidea, Gabb; Pal. Cal., Vol. 2, p. 11, pl. 2, fig. 18.

? Post-Pliocene, San Pedro.

C. VETUSTA, Gabb.

C. vetusta, Gabb; Pal. Cal., Vol. 2, p. 12, pl. 2, fig. 19.

Miocene, Martinez.

C. GRACILIOR, Cpr.

C. gracilior, Cpr.; Pal. Cal., Vol. 2, p. 50.

Post-Pliocene, Santa Barbara.

C. ALTISPIRA, Gabb.

C. altispira, Gabb; Pal. Cal., Vol. 2, p. 50, pl. 14, fig. 7.

Pliocene, San Fernando.

BITTIUM, Leach. B. ASPERUM, Gabb.

Turbonilla aspera, Gabb; Proc. Phil. Acad., 1861, p. 368.

Bittium asperum, Gabb; Pal. Cal. (1866), Vol. 2, p. 12, pl. 2, fig. 20.

B. asperum, Cpr.; A. Mag. N. Hist., 1866, p. 276.

B. rugatum, Cpr.; Brit. Assn. Rep., 1866, p. 539.

Post-Pliocene, Santa Barbara, San Diego, San Pedro. Living.

B. ARMILLATUM, Cpr.

Bittium armillatum, Cpr.; A. Mag. Nat. Hist., 1866, p. 276.

Post-Pliocene, Santa Barbara. Living.

CERITHIDEA, Swains. C. CALIFORNICA, Hald.

Cerithium Californicum, Hald, 1840, Fr. W. Univ. Moll., cover of No. 1.

Cerithidea Californica, Hald, Ms

Cerithium (Potamis) sacratum, Gld.; 1849, Proc. Bost. N. Hist. Soc., Vol. 3,
p. 118.

Id., Gld.; Wilkes's Exped. Rep., p. 114, pl. 10, fig. 116.

Potamis pullatus, Gld.; P. R. R. Rep., Vol. 5, p. 333, pl. 11, fig. 23, 24.

Cerithidea sacrata, Cpr.; 1856, Proc. Zool. Soc., Lond., p. 226.

Miocene, Santa Monica Mts.; Post-Pliocene, San Pedro. Living.

MELANIA, Lam. **M. TAYLORI**, Gabb.

M. Taylora, Gabb; Pal. Cal., Vol. 2, p. 13, pl. 2, fig. 21.

From a Fresh-water Tertiary Deposit on Snake River, Idaho.

LITHASIA, Hald. **L. ANTIQUA**, Gabb.

L. antiqua, Gabb; Pal. Cal., Vol. 2, p. 13, pl. 2, fig. 22.

With the preceding.

LITTORINA, Ferr. **L. PLANAXIS**, Phil.

L. planaxis, Phil.; teste Cpr.; Proc. Zool. Soc., Lond., 1856, p. 226.

L. patula, Gld.; 1846, Proc. Bost. N. Hist. Soc., p. 52.

Pliocene, Kirker's Pass; Post-Pliocene, San Diego, San Nicholas Isd. Living.

L. RÉMONDII, Gabb.

L. Rémondii, Gabb; Pal. Cal., Vol. 2, p. 14, pl. 2, fig. 23.

Pliocene, Kirker's Pass.

LACUNA, Turton. **L. SOLIDULA**, Loven.

Lacuna solidula, Loven; teste Cpr.; Brit. Assn. Rep., 1863, p. 656.

L. carinata, Gld.; Proc. Bost. N. H. Soc., 1848, p. 75.

Littorina Pedroana, Con.; P. R. R. Rep., Vol. 5, p. 327, pl. 6, fig. 50.

Modelia striata, Gabb.; Proc. Phil. Acad., 1861, p. 368.

Post-Pliocene, Santa Barbara, San Pedro. Living.

TURRITELLA, Lam. **T. COOPERII**, Cpr.

T. Cooperii, Cpr.; Brit. Assn. Rep., 1863, p. 655.

Pliocene, San Fernando; Post-Pliocene, Santa Barbara, San Pedro. Living.

T. JEWETTII, Cpr.

Turritella Jewettii, Cpr.; A. Mag. N. H., 1866, 276.

Post-Pliocene, San Diego, Santa Barbara. Living.

T. HOFFMANNII, Gabb.

T. Hoffmannii, Gabb; Pal. Cal., Vol. 2, p. 14, pl. 2, fig. 24.

Miocene, Santa Clara County; Sespi Cañon, Santa Barbara County.

T. INEZANA, Con.

T. Inezana, Con. ; P. R. R. Rep., Vol. 7, p. 195, pl. 8, fig. 4.
Miocene, Santa Inez and Santa Monica Mts.

T. VARIATA, Con.

T. variata, Con. ; P. R. R. Rep., Vol. 7, p. 195, pl. 8, fig. 5.
Miocene, Santa Monica Mts.

CÆCUM, Fleming. C. COOPERII, Cpr.

C. Cooperii, Cpr. ; Brit. Assn. Rep., 1863, p. 655.
Post-Pliocene, San Diego. Living.

CRUCIBULUM, Schum. C. SPINOSUM, Sby.

Calyptræa spinosa, Sby ; Genera of Shells, Sp. 6.
Crucibulum spinosum, Rve. ; Icon. Conch., Sp. 10.
Crucibulum spinosum, Con. ; P. R. R. Rep., Vol. 5, p. 327, pl. 5, fig. 46.
Post-Pliocene, Santa Barbara. Living.

TROCHITA, Schum. T. COSTELLATA, Con.

T. costellata, Con. ; P. R. R. Rep., Vol. 6, p. 195, pl. 7, fig. 3.
Miocene, Santa Monica and Santa Inez Mts.

T. FILOSA, Gabb.

T. filosa, Gabb ; Pal. Cal., Vol. 2, p. 15, pl. 2, fig. 25.
Miocene, Walnut Creek.

T. INORNATA, Gabb.

T. inornata, Gabb ; Pal. Cal., Vol. 2, p. 51, pl. 14, fig. 8, 8 a.
Miocene, Half-Moon Bay.

CRYPTA, Humph. C. GRANDIS, Midd.

C. grandis, Midd. ; Mal. Ross., pt. 2, p. 101, pl. 11, fig. 8, 9, 10.
Crepidula praerupta, Con. ; Wilkes's Exped., p. 727, pl. 19, fig. 9, 10.
Crypta praerupta, Con. ; Jour. Conch., 1865, p. 151.

Crypta princeps, Con.; P. R. R. Rep., Vol. 5, p. 326, pl. 6, fig. 52.

Miocene, Walnut Creek, Martinez, Foxin's, Astoria, Tomales, Kirker's Pass, and elsewhere; Pliocene, San Fernando, Santa Barbara, Half-Moon Bay, Kirker's Pass, Santa Rosa, Russian River; Post-Pliocene, Santa Barbara, San Pedro. Living.

C. LINGULATA, Gld., sp.

Crepidula lingulata, Gld.; Otia, p. 15.

Crypta lingulata, H. & A. Ad.; Gen. Rec. Moll., Vol. 1, p. 369.

Post-Pliocene, Santa Barbara. Living.

C. ADUNCA, Sby., sp.

Crepidula adunca, Sby.; Tank. Cat., app., p. 7.

Crypta adunca, H. & A. Ad.; Gen. Rec. Moll., Vol. 1, p. 369.

Pliocene, San Fernando; Post-Pliocene, San Pedro. Living.

If *adunca*, Sby. = *rostriformis*, Gld., as believed by Carpenter, then this species will probably include *rostralis*, Con., from the Oregon Miocene.

C. NAVICELLOIDES, Nutt., sp.

Crepidula navicelloides, Nutt.; Jay's Cat., 3035.

Crypta id., Cpr.; Brit. Assn. Rep.

Post-Pliocene, Santa Barbara. Living.

C. DORSATA, Brod., sp.

Crepidula dorsata, Brod.; Zool. Proc., 1834, p. 38.

Crypta dorsata, H. & A. Ad.; Gen. Rec. Moll., Vol. 1, p. 369.

Pliocene, San Fernando. Living.

HIPPONYX, Deifr. H. GRAYANUS, Mke.

H. Grayanus, Mke.; Proc. Zool. Soc., Lond., 1856, p. 4.

Post-Pliocene, San Pedro. Living.

PHASIANELLA, Lam. P. COMPTA, Gld.

P. compta, Gld.; P. R. R. Rep., Vol. 5, p. 333, pl. 11, fig. 25, 26.

P. perforata, Phil.; Zeitsch. f. Mal. 1848, p. 164, (teste Rve.)

Post-Pliocene, San Pedro, San Diego. Living.

Carpenter denies the correctness of Reeve's opinion in this case.

PACHYPOMA, Gray. **P. BIANGULATA**, Gabb.

P. biangulata, Gabb; Pal. Cal., Vol. 2, p. 15, pl. 3, fig. 26.
Miocene, Martinez.

P. GIBBEROSUM, Chemn., sp.

Trochus gibberosus, Chemn.; Conch. Cab., Vol. 10, p. 278, vignette 23.
T. inequalis, Gmel.; (not Martyn), p. 3585.
T. ochraceus, Phil.; Zeits. f. Mal., 1846, p. 101.
Pachypoma gibberosum, Cpr.; Brit. Assn. Rep., 1863, p. 651.
Post-Pliocene, San Pedro. Living.

POMAULEX, Gray. **P. UNDOSUS**, Wood, sp.

Trochus undosus, Wood; Suppl., p. 16, pl. 5, fig. 1.
T. balænarum, Val.; Voy. Venus, pl. 3, fig. 1.
Pomaulax undosus, Cpr.; B. A. Rep., 1863, p. 651.
Post-Pliocene, San Pedro and San Diego. Living.

CALLIOSTOMA, Swains. **C. ANNULATUM**, Mart., sp.

Trochus annulatus, Mart.; Univ. Conch., Vol. 1, fig. 33.
Zizyphinus annulatus, A. Ad.; Zool. Proc., 1851, p. 164.
Zizyphinus annulatus, Gray; Dieffenbach's N. Zealand, p. 237, No. 72.
Calliostoma annulatum, Cpr.; Brit. Assn. Rep., p. 652.
Post-Pliocene, San Pedro. Living.

C. COSTATUM, Mart., sp.

Trochus costatus, Mart.; Univ. Conch., pl. 10, fig. 3.
Calliostoma costatum, Cpr.; Brit. Assn. Rep., p. 652.
Pliocene, San Fernando; Post-Pliocene, San Pedro. Living.

C. CANALICULATUM, Mart., sp.

Trochus canaliculatus, Mart.; Univ. Conch., Vol. 1, fig. 32.
Zizyphinus canaliculatus, Gray; Travels in New Zealand, p. 237.
Calliostoma canaliculatum, Cpr.; Brit. Assn. Rep., p. 652.
Post-Pliocene, San Pedro. Living.

C. TRICOLOR, Gabb.

Calliostoma, tricolor, Gabb; Proc. Cal. Acad., 1865, p. 186.

Id., Gabb; Pal. Cal., Vol. 2, p. 17, pl. 3, fig. 28.

Post-Pliocene, San Pedro, Santa Barbara. Living.

PTYCHOSTYLIS, Gabb. **P. CAFFEA**, Gabb.

Turcica (P.) caffee, Gabb; Proc. Cal., A. N. S., 1865, p. 187.

Id., Gabb; Pal. Cal., Vol. 2, p. 16, pl. 3, fig. 27.

Thalotia caffee, Coop.; Geog. Cat. W. C. Moll., 1867, p. 26.

Compare *Trochus Adamsianus*, Schrenck, 1867, Reisen im Amur-Lande, Moll.,
p. 358, pl. 16, fig. 5.

Post-Pliocene, San Pedro. Living.

CHLOROSTOMA, Swains. **C. AUREOTINCTUM**, Fbs., sp.

Trochus (Monodonta) aureotinctum, Fbs.; Zool. Proc., 1850, p. 271, pl. 11,
fig. 7.

Chlorostoma aureotinctum, Cpr.; Brit. Assn. Rep., 1863, p. 652.

Post-Pliocene, Santa Barbara. Living.

C. PFEIFFERII, Phil., sp.

Trochus Pfeifferii, Phil.; Zeits. f. Mal., 1846, p. 104; Monog. Troch., p. 152,
pl. 25, fig. 2.

Trochus marcidus, Gld.; Mex. and Cal. Shells, p. 8, pl. 14, fig. 11.

Chlorostoma Pfeifferii, Cpr.; B. A. Rep., 1863, p. 652.

Post-Pliocene, Santa Barbara Island. Living.

C. BRUNNEUM, Phil., sp.

Trochus brunneus, Phil.; Zeits., 1848, p. 189; Monog. Troch., p. 300, pl. 43,
fig. 19.

Chlorostoma brunneum, Cpr.; B. A. Rep., 1863, p. 652.

Post-Pliocene, Santa Barbara Island. Living.

C. FUNEBRALE, A. Ad.

Chlorostoma funebreale, A. Ad.; Proc. Zool. Soc., 1854, p. 316.

Chlorostoma funebreale, Cpr.; B. A. Rep., 1863, p. 652.

Post-Pliocene, Santa Barbara, San Pedro. Living.

TROCHISCUS, Sby. **T. NORRISII**, Sby.

Trochiscus Norrisii, Sby. ; Mag. N. Hist., 2 Ser.

T. convexus, Cpr. ; Brit. Assn. Rep., 1863, p. 652 (*juv.*).

Post-Pliocene, Santa Barbara. Living.

LEPTOTHYRA, Cpr. **L. BACULA**, Cpr.

Leptonyx bacula, Cpr. ; Brit. Assn. Rep., 1863, p. 652.

Leptothyra bacula, Cpr. ; Brit. Assn. Rep., 1866.

Post-Pliocene, Santa Barbara. Living.

L. SANGUINEA, Cpr.

Leptonyx sanguinea, Cpr. ; Brit. Assn. Rep., 1863, p. 652.

Leptothyra sanguinea, Cpr. ; Brit. Assn. Rep., 1866.

Post-Pliocene, Santa Barbara. Living.

MARGARITA, Leach. **M. ACUTICOSTATA**, Cpr.

Margarita acuticostata, Cpr. ; Brit. Assn. Rep., 1863, p. 653.

Post-Pliocene, San Pedro. Living.

M. SALMONEA, Cpr.

M. salmonea, Cpr. ; Brit. Assn. Rep., 1863, p. 653.

Post-Pliocene, Santa Barbara. Living.

HALIOTIS, Linn. **H. RUFESCENS**, Sby.

Haliotis rufescens, Sby. ; App. to Bligh. Cat., p. 2.

Id., Reeve ; Icon. Conch., pl. 2, sp. 6.

Post-Pliocene, San Pedro and San Nicholas Island. Living.

LUCAPINA, Gray. **L. CRENULATA**, Sby., sp.

Fissurella crenulata, Sby. ; Conch. Ill., No. 19, fig. 31, 38.

Lucapina crenulata, Cpr. ; Zool. Proc., 1856, p. 223.

Post-Pliocene, San Pedro. Living.

GLYPHIS, Cpr. **G. ASPERA**, Esch., sp.

Fissurella aspera, Esch. ; Zool. Atl., pt. 5, p. 21, pl. 23, fig. 5.

Glyphis aspera, Cpr. ; Zool. Proc., 1856, p. 223.

Post-Pliocene, San Pedro. Living.

FISSURELLA, Brug. F. VOLCANO, Rve.

Fissurella volcano, Rve. ; Icon. Conch., pl. 4, sp. 2.

Post-Pliocene, San Pedro. Living.

CLYPIDELLA, Swains. C. BIMACULATA, Dall.

Clypidella bimaculata, Dall. ; (Mss.) in Coop. ; Geog. Cat. W. C. Moll., No. 470.

Post-Pliocene, San Pedro. Living.

C. CALLOMARGINATA, Cpr.

C. callomarginata, Cpr. ; Brit. Assn. Rep., 1866.

Post-Pliocene, San Pedro. Living.

DENTALIUM, Linn. D. HEXAGONUM, Sby.

D. hexagonum, Sby. ; Thes. Conch., Vol. 3, p. 103, fig. 10.

Post-Pliocene, San Pedro. Living.

ACMÆA, Esch. A. PATINA, Esch.

Acmaea patina, Esch. ; Zool. Atl., 1831, p. 19, pl. 24, fig. 7-9.

Post-Pliocene, Santa Barbara. Living.

A. PERSONA, Esch.

A. persona, Esch. ; loc. cit., p. 21, pl. 24, fig. 1, 2.

Post-Pliocene, San Nicholas Island. Living.

A. SCABRA, Nutt., sp.

Lottia scabra, Nutt. ; Jay's Cat., No. 2907.

Patella (Lottia) scabra, Gld. ; Bost. N. H. Soc. Proc., 1846, p. 152.

Id., Gld. ; Wilkes's Exped., p. 348, pl. 32, fig. 456.

Acmaea scabra, Cpr. ; Proc. Zool. Soc., 1856, p. 222.

Post-Pliocene, Santa Barbara. Living.

A. SPECTRUM, Nutt., sp.

Lottia spectrum, Nutt. ; Jay's Cat., No. 2877.

Patella (Lottia) spectrum, Gld. ; W. C. shells, p. 10.

Acmaea spectrum, Cpr. ; Brit. Assn. Rep., 1866.

Post-Pliocene, San Pedro, San Nicholas Island. Living.

A. RUDIS, Gabb.

A. rudis, Gabb; Pal. Cal., Vol. 2, p. 51, p. 14, fig. 9, 9 a.
Pliocene, San Fernando.

SCURRIA, M. Edw. S. MITRA, Esch., sp.

Acmaea mitra, Esch.; Zool. Atlas, 1833, p. 18, pl. 23, fig. 4.
A. mamillata, Esch.; *loc. cit.*, p. 18.
A. marmorea, Esch.; *loc. cit.*, p. 19.
Patella scurra, Less.; Voyage Coquille, p. 421.
Acmaea scurra, d'Orb.; Am. Mer., p. 478.
Patella (Acmaea) scurra, Midd.; Mal. Ross., Pt. 2, p. 34.
Scurria mitra, Gray; Genera, 1856.
Lottia pallida, Gray; Zool. Beechey's Voy., p. 147, pl. 39, fig. 1.
Post-Pliocene, San Pedro. Living.

NACELLA, Gray. N. INSESSA, Hds., sp.

Patella insessa, Hds.; An. Mag. Nat. Hist., Vol. 10, p. 82.
Nacella insessa, Cpr.; Brit. Assn. Rep., 1863, p. 650.
Post-Pliocene, San Pedro. Living.

CRYPTOCHITON, Gray. C. STELLERII, Midd.

Chiton Stellerii, Midd.; Bull. Acad. S. Pet., Vol. 6, p. 116.
Chiton (Cryptochiton) Stellerii, Midd.; Mal. Ross., pt. 1, p. 93, pl. 1, fig. 1, 2.
C. amiculatus, Sby.; Conch. Ill., Chitons, fig. 80.
C. Sitkensis, Rve.; Icon. Conch., pl. 10, sp. 55.
? *C. chlamys*, Rve., *loc. cit.*, sp. 60.
C. Californicus, Prescott; Am. Jour. Sci., 1864, p. 185.
Post-Pliocene, San Diego. Living.

BULLA, Linn. B. NEBULOSA, Gld.

Bulla nebulosa, Gld.; in A. Ad.; Thes. Conch., Vol. 2, p. 578, pl. 123, fig. 79, 80.
Pliocene, San Fernando. Living.

B. ADAMSI, Mke.

Bulla Adamsi, Mke.; Zeitsch., 1850, p. 162.
Post-Pliocene, San Pedro. Living.

TORNATINA, A. Ad. *T. CULCITELLA*, Gld., sp.

Bulla (Akeria) culcitella, Gld.; Mex. & Cal. Shells, p. 14, pl. 14, fig. 8.

Tornatina culcitella, Cpr.; Proc. Zool. Soc., Lond., 1856, p. 227.

Post-Pliocene, Santa Barbara. Living.

Besides the above Marine Univalves, several *Helices* have been found in a fossil state, usually in isolated deposits of doubtful age. The following are mentioned in my memoranda:

H. Mormonum, Pfr.

Pliocene, with human skull, near Angels' Camp, Calaveras County.

H. tudiculata, Binney.

Post-Pliocene, Marine deposits of San Pedro.

H. Hillebrandi, Newc.

Near Mariposa.

H. Tryoni and *H. facta*, Newc.; curious varieties from the islands off the southern coast. The former is thick and, in some cases, subangulated; the latter is much larger than the living forms, and very solid.

ACEPHALA.**ZIRPHÆA**, Leach. *Z. GABBII*, Tryon.

Z. Gabbii, Tryon; Proc. Phil. Acad. Nat. Sci., 1866, p. 144, pl. 1, fig. 1.

Z. Gabbii, Gabb; Pal. Cal., Vol. 2, p. 52, pl. 15, fig. 10.

Z. crispata, Cpr., Coop., Auct. (*non Linn.*).

Post-Pliocene, San Pedro. Living.

PENITELLA, Val. *P. PENITA*, Con., sp.

Pholas penita, Con.; Jour. A. N. S., 1 Ser., Vol. 7, p. 237, pl. 18, fig. 7.

Penitella Conradi, Val.; Voy. Venus, pl. 24, fig. 1.

Parapholas penita, Cpr.; Zool. Proc., 1856, p. 210.

Pholadidea penita, Cpr.; Brit. Assn. Rep.

Penitella spelæa, Con.; P. R. R. Rep., Vol. 5, p. 326, pl. 5, fig. 43.

Penitella penita, Tryon; Proc. Phil. A. N. S., 1861, Monog. Pholad., p. 87

Post-Pliocene, Santa Barbara. Living.

SOLENI, Linn. *S. ROSACEUS*, Cpr.

Solen ? var. *rosaceus*, Cpr.; Brit. Assn. Rep., W. C. Moll., 1863, p. 638.

Pliocene, San Fernando, Santa Rosa. Living.

Sub-Genus **HYPOGELLA**, Gray. *Solena*, Browne (*Pre-Lin.*).

S. (H.) **PROTEXTA**, Con., sp.

Donax protexta, Con. ; Wilkes's Exped., p. 728, pl. 17, fig. 9.

Solena protexta, Con. ; Jour. Conch., 1865, p. 152.

Plectosolen protexta, Con. ; Smithsonian Check List, No. 242.

Miocene, Astoria.

SILIQUARIA, Schum. ? S. **EDENTULA**, Gabb.

? *S. edentula*, Gabb, Pal. Cal., Vol. 2, p. 53, pl. 15, fig. 11.

Pliocene, San Fernando.

MACHÆRA, Gld. M. **PATULA**, Dixon, sp.

Solen patulus, Dixon ; Voyage Around the World, &c., p. 355, fig. 2.

Machæra patula, Cpr. ; Rep. W. C. Moll., 1863, p. 638.

Solen maxima, Wood. ; Gen. Conch., pl. 31, fig. 3.

Solecurtus Nuttallii, Con. ; Jour. Phil. A. N. S., 1 S., Vol. 7, p. 232, pl. 17, fig. 9.

Solemya ventricosa, Con. ; Wilkes's Exped., p. 723, pl. 17, fig. 7, 8.

Id., Con. ; Jour. Conch., 1865, p. 153.

Siliqua patula, Con. ; Jour. Conch., 1867, app., Cat. Solenidæ, p. 25.

Siliqua Californica, Con. ; Jour. Conch., 1867, p. 193.*

Miocene, Astoria, Martinez, Tomales, and Max. Martinez Ranch, Santa Clara County ; Pliocene, Santa Rosa. Living.

SOLECURTUS, Blainv. S. **SUBTERES**, Con.

S. subteres, Con. ; Jour. A. N. S. Phil., 1 Ser., Vol. 7, p. 233, pl. 17, fig. 10.

Post-Pliocene, Santa Barbara. Living.

GLYCIMERIS, Lam. G. **GENEROSA**, Gld., sp.

Panopæa generosa, Gld. ; Proc. Bost. N. H. Soc., 1850, p. 215.

Id., Gld. ; Wilkes's Exped., Moll., p. 385, pl. 34, fig. 507.

* Described from a young specimen, differing only in being a little straighter than usual on its basal margin. It seems incomprehensible to a Californian conchologist, how Mr. Conrad could have redescribed this familiar form, for which he had already made three synonyms, and with the fine series in the Academy's museum for comparison. "Body Bay," its locality, should read Bodega Bay. "*Nuttallii*" has been persistently referred by Mr. Conrad to the Sandwich Islands. It does not occur there, but is one of the commonest of our Californian shells.

Glycimeris generosa, H. & A. Ad. ; Gen. Rec. Moll., p. 350.

Mya abrupta, Con. ; Wilkes's Exped. Foss., p. 723, pl. 17, fig. 5.

Glycimeris abrupta, Con. ; Jour. Conch., 1865, p. 152.

G. Estrellanus, Con. ; P. R. R. Rep., Vol. 7, p. 194, pl. 7, fig. 5.

Miocene, Oregon, Martinez, Walnut Creek, near Mount Diablo, Esuella,
Foxin's ; Pliocene, San Fernando, Santa Barbara ; Post-Pliocene, Santa
Barbara. Living.

CRYPTOMYA, Con. *C. CALIFORNICA*, Con.

C. Californica, Con. ; Proc. Phil. Acad., 1849, p. 121.

Sphænia Californica, Con. ; Jour. A. N. S., 1 Ser., Vol. 7, p. 234, pl. 17, fig. 11.

Sphænia Californica, Cpr. ; Zool. Proc., 1856, p. 210.

Cryptomya ovalis, Con. ; P. R. R. Rep., Vol. 6, p. 69, pl. 2, fig. 2.

Miocene, Griswold's ; Pliocene, San Fernando, Santa Rosa ; Post-Pliocene,
Santa Barbara. Living.

MYTILIMERIA, Con. *M. NUTTALLII*, Con.

Mytilimeria Nuttallii, Con. ; Jour. A. N. S., 1 Ser., Vol. 7, p. 247.

Miocene, Tomales ; Post-Pliocene, San Pedro. Living.

THRACIA, Leach. *T. TRAPEZOIDES*, Con.

T. trapezoides, Con. ; Wilkes's Exped., p. 723, pl. 17, fig. 6.

Miocene, Astoria ; Pliocene, Eagle Prairie.

PANDORA, Brug. *P. SCAPHA*, Gabb.

Pandora scapha, Gabb ; Pal. Cal., Vol. 2, p. 18, pl. 4, fig. 32.

Miocene, Martinez.

CLIDOPHORA, Cpr. *C. PUNCTATA*, Con., sp.

Pandora punctata, Con. ; Jour. Phil. Acad., 1 S., Vol. 7, p. 288, pl. 17, fig. 1.

Clidophora punctata, Cpr. ; Proc. Zool. Soc., 1864, p. 598.

Miocene, near San Buenaventura. Living.

HEMIMACTRA, Swains. *H. LENTICULARIS*, Gabb.

H. lenticularis, Gabb ; Pal. Cal., Vol. 2, p. 19, pl. 4, fig. 33.

Miocene, Martinez.

? *H. OCCIDENTALIS*, Gabb.

? *Hemimactra occidentalis*, Gabb; Pal. Cal., Vol. 1, p. 54, pl. 15, fig. 13, 13 a.

Miocene, Martinez.

SCHIZODESMA, Gray. *S. ABSCISSA*, Gabb.

Schizodesma abscissa, Gabb; Pal. Cal., Vol. 2, p. 20, pl. 4, fig. 34.¹

Mulineia densata, Con.; *pars*, P. R. R. Rep., Vol. 6, p. 71.

Miocene, Martinez, San Pablo, Walnut Creek.

MULINEA, Gray. *M. DENSATA*, Con.

Mulineia densata, Con.; *pars*, P. R. R. Rep., Vol. 6, p. 71, pl. 3, fig. 12.

Mulineia densata, Gabb; Pal. Cal., Vol. 2, p. 19, pl. 5, fig. 35.

Miocene, Santa Barbara, San Pablo, Martinez, Walnut Creek, hills back of Oakland.

SCHIZOTHÆRUS, Con. *S. NUTTALLI*, Con.

Lutraria (Cryptodon) Nuttalli, Con.; Jour. A. N. S., Vol. 7, 1 S., p. 235, pl. 18, fig. 1.

Schizothærus Nuttalli, Con.; P. R. R. Rep., Vol. 5, p. 324, pl. 4, fig. 33.

Lutraria maxima, Midd.; Mal. Ross., 1849, p. 66, pl. 19, fig. 1, 4.

Mactra maxima, Rve.; Icon. Conch., pl. 1, sp. 4.

Lutraria capax, Gld.; Proc. Bost. N. H. Soc., 1850, p. 217.

Lutraria maxima, Gld.; Wilkes's Exped., p. 395, pl. 34, fig. 508.

Tresus maximus, H. & A. Ad.; Gen. Rec. Moll.

Pliocene, Santa Barbara; Post-Pliocene, Santa Barbara, San Diego, San Pedro. Living.

STANDELLA, Gray. *S. PLANULATA*, Con., sp.

Mactra planulata, Con.; Jour. Phil. Acad., 1 Ser., Vol. 7, p. 240.

M. Diegoana, Con.; P. R. R. Rep., Vol. 5, p. 325, pl. 5, fig. 45.

M. albaria, Con.; Am. Jour. Sci., 1848, p. 432, fig. 4.

Standella planulata, Cpr.; Brit. Assn. Rep., 1863, p. 640.

Miocene, Oregon, Max. Martinez Ranch, Martinez; Pliocene, San Fernando; Post-Pliocene, San Diego. Living.

S. FALCATA, Gld. sp.

Mactra falcata, Gld. ; Otia, p. 76.

Standella falcata, Cpr. ; Brit. Assn. Rep., 1863, p. 640.

Pliocene, Kirker's Pass. Living.

PSEUDOCARDIUM, Gabb. P. GABBII, Rém., sp.

Cardium Gabbii, Rémond ; Proc. Cal. Acad., 1863, p. 13.

Pseudocardium id., Gabb ; Pal. Cal., Vol. 2, p. 21, pl. 6.

Miocene, Martinez and Cerro Bonito, Monterey County ; Pliocene, Kirker's Pass.

GARI, Schum. G. (PSAMMOCOLA) ALATA, Gabb.

G. (Psammocola) alata, Gabb ; Pal. Cal., Vol. 2, p. 21, pl. 5, fig. 36.

Pliocene, Kirker's Pass.

TELLINA, Linn. T. CONGESTA, Con.

Tellina congesta, Con. ; P. R. R. Rep., Vol. 5, p. 323, pl. 3, fig. 14, 18-21.

Miocene, Monterey, San Pablo, San Diego, etc.

T. BODEGENSIS, Hds.

Tellina Bodegensis, Hds. ; Voy. Sulphur, p. 67, pl. 21, fig. 2.

T. emacerata, Con. ; Wilkes's Exped., p. 725, pl. 18, fig. 4.

Id., Con. ; Sm. Check List, No. 206 ; and Jour. Conch., 1865, p. 152.

Miocene, Astoria ; Post-Pliocene, San Pedro. Living.

LUTRICOLA, Blainv. L. ALTA, Con., sp.

Tellina alta, Con. ; Jour. Phil. Acad., Vol. 7, p. 258.

Lutricola alta, Cpr. ; Brit. Assn. Rep., p. 639.

Arcopagia medialis, Con. ; P. R. R. Rep., Vol. 7, p. 72, pl. 2, fig. 6.

Miocene, Monterey ; Pliocene, San Fernando, Santa Barbara ; Post-Pliocene, San Pedro. Living.

L. VIRIDOTINCTA, Cpr.

Lutricola viridotincta, Cpr. ; Brit. Assn. Rep., 1866.

Serobicularia viridotincta, Cpr. ; Proc. Zool. Soc., 1866, p. 160.

Post-Pliocene, Santa Barbara. Living.

ANGULUS, Muhl. A. GOULDII, Hanley.

Tellina Gouldii, Hanley; Thes. Conch., Vol. 1, p. 272, pl. 56, fig. 26.

Angulus Gouldii, Hanley; Ms. (Cpr.), Brit. Assn. Rep., 1863, p. 639.

Post-Pliocene, San Diego. Living.

MACOMA, Leach. M. SECTA, Con., sp.

Tellina secta, Con.; Jour. Phil. Acad., 1 ser., Vol. 7, p. 257.

Macoma secta, H. & A. Ad.; Genera, p. 401.

Tellina ligamentina, Desh.; Guer. Mag., 1843, pl. 8.

Post-Pliocene, Santa Barbara. Living.

M. EDULIS, Nutt. sp.

Macoma var. *edulis*, Nutt.; Cpr.; Brit. Assn. Rep., 1863, p. 639.

Pliocene, San Fernando, Santa Barbara; Post-Pliocene, San Pedro. Living.

M. YOLDIFORMIS, Cpr.

Macoma yoldiformis, Brit. A. Rep., 1863, p. 639.

Post-Pliocene, Santa Barbara. Living.

M. NASUTA, Con., sp.

Tellina nasuta, Con.; Jour. Phil. Acad., Vol. 7, p. 258.

? *T. Oregonensis*, Con.; Am. Jour. Sci., 1848, p. 432, fig. 5.

T. tersa, Gld.; Mex. and Cal. Shells, p. 25, pl. 16, fig. 2.

Macoma nasuta, Cpr.; Brit. Assn. Rep., 1863, p. 639.

Upper Miocene, Foxin's; Pliocene, San Fernando, Santa Rosa; Post-Pliocene, San Pedro. Living.

M. INQUINATA, Desh., sp.

Tellina inquinata, Desh.; Proc. Zool. Soc., 1854, p. 357.

Macoma inquinata, Cpr.; Rep. W. C. Moll., Brit. Assn., 1863, p. 639.

Post-Pliocene, San Diego. Living.

M. EXPANSA, Cpr.

M. expansa, Cpr.; Brit. Assn. Rep., 1863, p. 639.

Post-Pliocene, San Pedro. Living.

M. PEDROANA, Con., sp.

Tellina Pedroana, Con. ; P. R. R. Rep., Vol. 5, p. 323, pl. 3, fig. 17.
Post-Pliocene, San Pedro. Living.

M. INCONSPICUA, Brod. & Sby., sp.

Tellina inconspicua, B. & S. ; Zool. Jour., 1829, p. 363 ; Beechey's Voy., p. 153,
pl. 41, fig. 6.
Sanguinolaria Californica, Con. ; Jour. Phil. Acad., Vol. 7, p. 231, pl. 17, fig. 11.
Macoma inconspicua, Cpr. ; Brit. Assn. Rep., 1863.
Post-Pliocene, Santa Barbara. Living.

SEMELE, Schum. **S. DECISA**, Con., sp.

Amphidesma decisa, Con. ; Jour. Phil. Acad., 1 ser., Vol. 7, p. 234, pl. 17, fig. 12.
Semele decisa, Cpr. ; Proc. Zool. Soc., 1856, p. 213.
Post-Pliocene, San Pedro. Living.

S. PULCHRA, Sby., sp.

Amphidesma pulchra, Sby. ; Conch. Ill., No. 2, fig. 2.
Semele pulchra, Cpr. ; Rep. W. C. Moll., Brit. Assn., 1856, 1863.
Post-Pliocene, San Pedro. Living.

CUMINGIA, Sby. **C. CALIFORNICA**, Con.

Cumingia Californica, Con. ; Jour. Phil. Acad., 1 ser., Vol. 7, p. 234, pl. 17,
fig. 12.
Post-Pliocene, Santa Barbara. Living.

MERCENARIA, Schum. **M. PERLAMINOSA**, Con.

M. perlaminosa, Con. ; Proc. Phil. Acad., 1855, p. 267.
Id., Gabb ; Pal. Cal., Vol. 2, p. 22, pl. 5, fig. 38 ; p. 55, pl. 15, fig. 14.
Venus Kennerleyi, Rve. ; Icon. Conch., Venus, pl. 12, fig. 41.
Mercenaria Kennerleyi, Cpr. ; Rep. on W. C. Moll., 1866.
Post-Pliocene, Santa Barbara. Living.

CHIONE, Megerle. **C. SUCCINCTA**, Val., sp.

Venus succincta, Val. ; Humb. & Bonpl., Obs. sur. Zool., p. 219, pl. 48, fig. 1.
Chione succincta, Cpr. ; Rep. W. C. Moll., Brit. Assn., 1863, p. 641.
Venus Californica, Con. ; Jour. Phil. Acad., Vol. 7, p. 251.

V. Nuttallii, Con. loc. cit., p. 250, pl. 19, fig. 14.

V. lamellifera, Con. ; Wilkes's Exped., Geology, p. 724, pl. 17, fig. 12.

V. lamellifera, Con. ; Jour. Conch., 1865, p. 152.

Not *V. lamellifera*, Con. Jour. Phil. Acad., Vol. 7, p. 251, pl. 19, fig. 19, (= *Tapes straminea* var. *runderata*.)

V. brevilineata, Con. ; Wilkes's Exped., p. 724, pl. 17, fig. 13.

Dione brevilineata, Con. ; Jour. Conch., 1865, p. 152.

Venus securis, Shum. ; Trans. St. Louis Acad., Vol. 1, p. 122.

Miocene, Martinez, Griswold's, Foxin's, San Pablo ; Oregon, Coose Bay, Astoria, Eugene City ; Pliocene, San Fernando, Santa Rosa ; Post-Pliocene, San Pedro, Santa Barbara, San Diego. Living.

C. MATHEWSONII, Gabb.

C. Mathewsonii, Gabb ; Pal. Cal., Vol. 2, p. 23, pl. 5, fig. 39.

Miocene, Martinez.

C. WHITNEYI, Gabb.

C. Whitneyi, Gabb ; Pal. Cal., Vol. 2, p. 23, pl. 5, fig. 40.

Miocene, Martinez.

C. PERTENUIS, Gabb.

Venus Kennerleyi ? Gabb, not Reeve ; Pal. Cal., Vol. 2, p. 22, pl. 5, fig. 37.

V. pertenuis, Gabb ; loc. cit., note.

Miocene, Martinez.

C. OREGONA, Con., sp.

Cytherea Oregona, Con. ; Am. Jour. Sci., 1848, p. 432, fig. 8.

Dione Oregona, Con. ; Jour. Conch., 1865, p. 152.

Miocene, Astoria.

CARYATIS, Roem. C. BARBARENSIS, Gabb.

C. Barbarensis, Gabb ; Pal. Cal., Vol. 2, p. 56, pl. 15, fig. 15, 15 a.

Pliocene, Santa Barbara.

MERETRIX, Lam. M. TRASKII, Con. sp.

Lutraria Traskii, Con. ; P. R. R. Rep., Vol. 5, p. 324, pl. 3, fig. 23.

Meretrix Traskii, Gabb ; Pal. Cal., Vol. 2, p. 56.

Miocene, Monterey County.

PSEPHIS, Cpr. **P. TANTILLA**, Gld., sp.

Venus tantillus, Gld. ; Shells of Cal. and Mex., p. 33, pl. 15, fig. 10.

Trigona tantilla, Cpr. ; Proc. Zool. Soc., 1856, p. 201.

Venus rhyssomia, Gabb ; Proc. Phil. Acad., 1861, p. 371.

Psephis tantilla, Cpr. ; Rep. W. C. Moll., 1863, p. 640.

Post-Pliocene, Santa Barbara. Living.

P. LORDI, Baird, sp.

Chione Lordi, Baird ; Proc. Zool. Soc., 1863, p. 69.

Psephis Lordi, Cpr. ; Rep. W. C. Moll., 1863, p. 641.

Post-Pliocene, Santa Barbara. Living.

PACHYDESMA, Con. **P. CRASSATELLOIDES**, Con.

Cytherea (Trigonella) crassatelloides, Con. ; Jour. Phil. Acad., Vol. 7, p. 253, pl. 19, fig. 17.

Trigona crassatelloides, Desh. ; Cat. Ven., p. 46.

Pachydesma crassatelloides, Con. ; Proc. Phil. Acad., 1854, p. 121.

Donax stultorum, Mawe ; Conch., pl. 9, fig. 7.

Trigona stultorum, Gray, Analyst ; and Hanley ; Sp. Shells, p. 105.

Cytherea solidissima, Phil. ; Zeits. fur. Mal., 1851, p. 74, No. 100.

Post-Pliocene, San Diego. Living.

CALLISTA, Poli. **C. (? TAPES) VOYI**, Gabb.

Callista Voyi, Gabb ; Pal. Cal., Vol. 2, p. 24, pl. 5, fig. 41.

Pliocene, Eagle Prairie, Humboldt County.

LIOCONCHA, Mörch. **L. NEWCOMBIANA**, Gabb.

Lioconcha Newcombiana, Gabb ; Proc. Cal. Acad., 1865.

Post-Pliocene, San Diego. Living.

AMIAANTIS, Cpr. **A. CALLOSA**, Con., sp.

Cytherea callosa, Con. ; Jour. Acad., Vol. 7, p. 252.

Venus callosa, Sby. ; Thes. Conch., Vol. 2, p. 712, pl. 154, fig. 44, 45.

Dosinia callosa, Cpr. ; Zool. Proc., 1856, p. 216.

Amiantis callosa, Cpr. ; Rep. W. C. Moll., Brit. Assn., p. 640.

Post-Pliocene, Santa Barbara. Living.

DOSINIA, Scopoli. D. CONRADI, Gabb.

- D. Conradi*, Gabb ; Pal. Cal., Vol. 2, p. 25, pl. 5, fig. 43.
D. alta, Con. ; (not Dkr.), Proc. Phil. Acad., 1856, p. 315.
 Not *D. alta*, Con. ; P. R. R. Rep., Vol. 5, p. 320, pl. 2, fig. 2, (= *D. elevata* G.)
D. alta, Con. ; P. R. R. Rep., Vol. 6, p. 71, pl. 3, fig. 13.
D. alta, Con. ; P. R. R. Rep., Vol. 7, p. 193.
 Miocene, San Emidio, Monterey.

D. PONDEROSA, Gray, sp.

- Artemis ponderosa*, Gray ; Analyst, 1838, Vol. 8, p. 309.
Cytherea gigantea, Sby. ; Phil. Abbild., pl. 7, fig. 1.
Dosinia ponderosa, H. & A. Ad. ; Gen. Rec. Moll., Vol. 2, p. 432.
 Post-Pliocene, Kirker's Pass, Santa Barbara. Living.

D. MATHEWSONII, Gabb.

- Dosinia Mathewsonii*, Gabb ; Pal. Cal., Vol. 2, p. 57, pl. 15, fig. 16.
 Miocene, Martinez, Griswold's.

TAPES, Megerle. T. STAMINEA, Con. sp.

- Venus staminea*, Con. ; Jour. Phil. Acad., Vol. 7, p. 250, pl. 19, fig. 15.
Venus lamellifera, Con. ; loc. cit., p. 251, pl. 19, fig. 19, (= var. *rudrata*.)
 Not *V. lamellifera*, Con. ; Wilkes's Exped., p. 724, pl. 17, fig. 12, (= *Chione succincta*.)
Tapes diversum, Con. ; P. R. R. Rep., Vol. 5, p. 324, pl. 4, fig. 31.
T. lineatum, Con. ; P. R. R. Rep., Vol. 6, p. 72, pl. 2, fig. 7.
Venus rigida, Gld. ; Proc. Bost. N. Hist. Soc., 1850, p. 277.
Id., Gld. ; Wilkes's Exped., p. 420, pl. 37, fig. 538.
Tapes staminea, Cpr. ; Brit. Assn. Rep., W. C. Moll., 1863, p. 641.
 Miocene, Santa Clara County, Foxin's ; Pliocene, Kirker's Pass, San Fernando, Santa Rosa ; Post-Pliocene, Santa Barbara, San Pedro. Living.

T. TENERRIMA, Cpr.

- Tapes tenerrima*, Cpr. ; Zool. Proc. 1856, p. 200.
 Pliocene, Santa Barbara. Living.

T. STALEYI, Gabb.

Dosinia Staley, Gabb; Pal. Cal., Vol. 2, p. 24, pl. 7, fig. 42.

Tapes id., Gabb; Index to plate, *loc. cit.*

Tapes id., Gabb; Pal. Cal., Vol. 2, p. 57, pl. 16, fig. 17, 17 a.

Pliocene, Santa Rosa.

? T. TRUNCATA, Gabb.

Tapes ? truncata, Gabb; Pal. Cal., Vol. 2, p. 25, pl. 7, fig. 44.

Miocene, Griswold's.

SAXIDOMUS, Con. S. GRACILIS, Gld., sp.

Tapes gracilis, Gld.; P. R. R. Rep., Vol. 5, p. 333, pl. 19, fig. 20.

Saxidomus aratus, Gld.; 1861, Otia, p. 168.

Venus maxima, Phil.; Abbild., Vol. 2, pl. 6, fig. 1.

Saxidomus gracilis, Cpr.; Brit. Assn. Rep., 1866.

Miocene, Santa Cruz, Walnut Creek, Martinez, Santa Inez; Pliocene, San Fernando, Santa Barbara; Post-Pliocene, Santa Barbara. Living.

S. NUTTALLI, Con.

Saxidomus Nuttalli, Con.; Jour. Phil. Acad., Vol. 7, p. 249, pl. 19, fig. 12.

Post-Pliocene, Santa Barbara, San Pedro. Living.

S. GIBBOSUS, Gabb.

Saxidomus gibbosus, Gabb; Pal. Cal., Vol. 2, p. 58, pl. 16, fig. 18, a, b.

Pliocene, Eagle Prairie, Humboldt County.

CYRENA, Lam. C. CALIFORNICA, Gabb.

Cyrena Californica, Gabb; Pal. Cal., Vol. 2, p. 26, pl. 7, fig. 45.

Pliocene, Kirker's Pass.

CARDIUM, Linn. C. CORBIS, Martyn, sp.

Pectunculus corbis, Mart.; Univ. Conch., pl. 28, fig. 2.

C. corbis, (Desh. Mss.) Cpr.; Brit. Assn. Rep., 1863, pp. 527, 642.

C. Californianum, Con.; Jour. Acad. Phil., Vol. 7, p. 229, pl. 17, fig. 4.

C. Nuttalli, Con.; *loc. cit.*, p. 229, pl. 17, fig. 3.

Pliocene, Twelve-mile House, below San Francisco, San Fernando; Post-Pliocene, Santa Barbara, San Pedro, San Francisco. Living.

C. MEEKIANUM, Gabb.

C. Meekianum, Gabb ; Pal. Cal., Vol. 2, p. 27, pl. 7, fig. 46.

Pliocene, Eagle Prairie.

C. CENTIFILOSUM, Cpr.

Cardium centifilosum, Cpr. ; Rep. W. C. Moll., 1863, p. 642.

Post-Pliocene, San Pedro. Living.

C. PANAMENSE, Sby.

Cardium Panamense, Sby. ; Proc. Zool. Soc, 1833, p. 85.

Post-Pliocene, San Pedro. Living.

Sub-Genus **LÆVICARDIUM**, Swains. **C. (L.) ELATUM**, Sby.

Cardium elatum, Sby., Rve. ; Icon. Conch., pl. 8, fig. 41.

Id., Val. ; Voy. Venus, pl. 17, fig. 1.

Liocardium elatum, Cpr. ; B. Assn. Rep., 1863, p. 642.

Post-Pliocene, San Diego. Living.

C. (L.) SUBSTRIATUM, Con.

Cardium substriatum, Con. ; Jour. Phil. Acad., Vol. 7, p. 228, pl. 17, fig. 2.

Liocardium substriatum, Cpr. ; Br. Assn. Rep., W. C. Moll., 1863, p. 642.

Post-Pliocene, San Pedro. Living.

CONCHOCELE, Gabb. **C. DISJUNCTA**, Gabb.

Conchocele disjuncta, Gabb ; Pal. Cal., Vol. 2, p. 28, pl. 7, fig. 48.

Post-Pliocene, Dead Man's Island, off San Pedro.

This is a small detached mass of very recent Tertiary, rich in fossils, all of living species, except the present one. I quoted it as "probably miocene," in describing the species, but have since obtained more definite information by a personal visit to the locality.

C. BISECTA, Con., sp.

Venus bisecta, Con. ; Wilkes's Exped., p. 724, pl. 17, fig. 10.

Cyprina bisecta, Con. ; Jour. Conch., 1865, p. 153.

Id., Con. ; Check List, No. 160.

Miocene, Astoria.

LUCINA, Brug. **L. BOREALIS**, Linn., sp.

- L. borealis*, Linn. ; Syst. Nat., Ed. 12, p. 1413.
L. acutilineata, Con. ; Wilkes's Exped., p. 725, pl. 18, fig. 2.
Cyclas acutilineatus, Con. ; Jour. Conch., 1865, p. 153.
Pectunculus patulus, Con. ; Jour. Conch., 1865, p. 153.
 Not *P. patulus*, Con. ; Wilkes's Exped., p. 726, pl. 18, fig. 8, (= *Axipæa id.*)
Lucina tetrica, Con. ; Proc. Phil. Acad., 1856, p. 314.
 Miocene, Oregon, Foxin's, Martinez, Griswold's, Orestimba Cañon ; Pliocene,
 San Fernando, Santa Rosa ; Post-Pliocene, Santa Barbara, San Pedro, Dead
 Man's Island, San Diego, etc. Living.

L. NUTTALLI, Con.

- L. Nuttalli*, Con. ; Jour. Phil. Acad., Vol. 7, p. 255, pl. 20, fig. 2.
 Post-Pliocene, San Pedro, Santa Barbara. Living.

L. CALIFORNICA, Con.

- L. Californica*, Con. ; Jour. Phil. Acad., Vol. 7, p. 255, pl. 20, fig. 1.
 Post-Pliocene, San Pedro, Santa Barbara, Living.

Sub-Genus **HERE**, Gabb. **L. (H.) RICHTHOFFENI**, Gabb.

- L. (H.) Richthofeni*, Gabb ; Pal. Cal., Vol. 2, p. 29, pl. 8, fig. 49
 Pliocene, San Fernando.

MYSIA, Leach. **M. PARILIS**, Con.

- Loripes parilis*, Con. ; Am. Jour. Sci., 1848, p. 433, fig. 7.
Mysia parilis, Con. ; Jour. Conch., 1865, p. 153.
 Miocene, Oregon.

CRASSATELLA, Lam. **C. COLLINA**, Con.

- Crassatella collina*, Con. ; P. R. R. Rep., Vol. 7, p. 193, pl. 6, fig. 1, 2.
Id., Gabb ; Pal. Cal., Vol. 2, p. 29, pl. 8, fig. 50.
 Miocene, Santa Inez Mts., Ojai Ranch, Santa Barbara County.

CARDITA, Lam. **C. VENTRICOSA**, Gld.

- Cardita ventricosa*, Gld. ; Proc. Bost. N. H. Soc., 1850, p. 276.
Id., Gld. ; Wilkes's Exped., p. 417, pl. 36, fig. 532.

- C. subtenta*, Con. ; Wilkes's Exped., p. 726, pl. 18, fig. 12.
Cardium subtentum, Con. ; Jour. Conch., 1865, p. 153.
Cardita monilicosta, Gabb ; Proc. Phil. Acad., 1861, p. 371.
Cardita occidentalis, Con. ; Proc. Phil. Acad., 1855, p. 267.
Cardita occidentalis, Con. ; P. R. R. Rep., Vol. 6, p. 73, pl. 5, fig. 24.
Venericardia borealis var. *ventricosa*, Cpr. ; B. A. Rep., W. C. Moll., p. 642.
Miocene, Astoria, Santa Monica, Foxin's ; Pliocene, Santa Barbara, San Fernando ; Post-Pliocene, Santa Barbara, San Pedro. Living.

MYTILUS, Linn. **M. CALIFORNIANUS**, Con.

- Mytilus Californianus*, Con. ; Jour. Phil. Acad., Vol. 7, p. 242.
Pliocene, San Fernando ; Post-Pliocene, Santa Barbara. Living.

M. MATHEWSONII, Gabb.

- M. Mathewsonii*, Gabb ; Pal. Cal., Vol. 2, p. 30, pl. 8, fig. 51.
Miocene, Martinez, Santa Monica, San Luis Obispo.

MODIOLA, Lam. **M. CAPAX**, Con.

- Modiola capax*, Con. ; Jour. Phil. Acad., 1 Ser., Vol. 7, p. 262.
Post-Pliocene, Santa Barbara. Living.

M. RECTA, Con.

- Modiola recta*, Con. ; Jour. Phil. Acad., 1 Ser., Vol. 7, p. 245, pl. 19, fig. 1.
Miocene, El Toro Ranch ; Pliocene, Santa Rosa, San Fernando. Living.

M. FLABELLATA, Gld.

- Modiola flabellata*, Gld. ; Otia, p. 93.
Pliocene, San Fernando. Living.

M. MULTIRADIATA, Gabb.

- Modiola multiradiata*, Gabb ; Pal. Cal., Vol. 2, p. 30, pl. 8, fig. 52.
Miocene, Martinez, San Emidio, Walnut Creek.

SEPTIFER, Recluz. **S. BIFURCATUS**, Rve., sp.

- Mytilus bifurcatus*, Rve. ; Icon. Conch., pl. 9, fig. 41.
Septifer bifurcatus, Cpr. ; Brit. Assn. Rep., 1866.
Post-Pliocene, San Diego. Living.

ARCA, Linn. **A. SULCICOSTA**, Gabb.

Arca sulcicosta, Gabb; Pal. Cal., Vol. 2, p. 31, pl. 9, fig. 53.
Pliocene, Santa Rosa.

A. MICRODONTA, Con.

Arca microdonta, Con.; P. R. R. Rep., Vol. 5, p. 323, pl. 3, fig. 29.
A. canalis, Con.; P. R. R. Rep., Vol. 6, p. 72, pl. 2, fig. 8.
A. trilineata, Con.; P. R. R. Rep., Vol. 6, p. 72, pl. 2, fig. 9.
? *A. devincta*, Con.; *q. v.* Should these prove to be the same, *devincta* being the earliest name given, will have to stand as the name of the species.
Miocene, Martinez, Griswold's, Santa Barbara, near Buena Vista Lake, El Toro and Najohui Ranches (Oregon ?—*devincta*); Pliocene, San Fernando.

AXINÆA, Poli. **A. PATULA**, Con., sp.

Pectunculus patulus, Con.; Wilkes's Exped., p. 726, pl. 18, fig. 8.
Not *P. patulus*, Con.; Jour. Conch, 1865, p. 153 (= *Lucina borealis*).
Axinæa Barbarensis, Con.; P. R. R. Rep., Vol. 6, p. 73, pl. 3, fig. 11.
Id., Con.; P. R. R. Rep., Vol. 7, p. 194, pl. 6, fig. 3.
Miocene, Astoria, San Pablo, Santa Barbara, Martinez; Pliocene, Santa Rosa.

NUCULA, Lam. **S. Gen. *Acila*, H. & A. Ad. N. (A.) CASTRENSIS**, Hinds, sp.*

Nucula Castrensis, Hinds; Proc. Zool. Soc., 1843, p. 98.
Id., Hds.; Voy. Sulphur, p. 61, pl. 17, fig. 5.
N. (Acila) Castrensis, H. & A. Ad., Genera. Rec. Moll., Vol. 2, p. 545.
Nucula divaricata, Con.; Wilkes's Exped., p. 725, pl. 18, fig. 6.
Nucula divaricata, Con. Am. Jour. Sci., 1848, p. 432, fig. 1.
Nucula decisa, Con.; P. R. R. Rep., Vol. 5, p. 322, pl. 3, fig. 19.
N. Conradi, Meek; Smithsonian Check List.
Miocene, Astoria, Martinez; Pliocene, San Fernando; Post-Pliocene, Santa Barbara, San Pedro, San Diego. Living.

* It has been claimed that this is the same as an English crag species, *N. Cobboldiæ*. I hardly think it necessary to attempt a serious refutation of the idea. It would be contrary to all received notions of geographical distribution, to find here an isolated species from an entirely distinct fauna, and out of another ocean. The mistake has arisen from the close resemblance that exists between all the species of this sub-genus; a similar confusion having been created by Mr. Conrad between the present shell, and an allied form from the cretaceous beds of California.

LEDIA, Schum. *L. CÆLATA*, Hds., sp.

Nucula cælata, Hds.; Proc. Zool. Soc., 1843, p. 99; Voy. Sulph., p. 64, pl. 18, fig. 13.

Leda cælata, Hanley; Thes. Conch., Vol. 3, No. 42, fig. 95, 96.

Pliocene, San Fernando; Post-Pliocene, Santa Barbara, San Pedro. Living.

L. CUNEATA, Sby.

Leda cuneata, Sby.; Thes. Conch., Vol. 3, p. 128, figs. 92, 93.

Post-Pliocene, Santa Barbara, San Pedro. Living.

YOLDIA, Möll. *Y. NASUTA*, Gabb.

Yoldia nasuta, Gabb; Pal. Cal., Vol. 1, p. 216, pl. 32, fig. 287.

Tertiary (horizon?) "Los Angeles."

Y. IMPRESSA, Con., sp.

Nucula impressa, Con.; Wilkes's Exped., p. 726, pl. 18, fig. 7.

Yoldia impressa, Meek; Sm. Check List, Miocene.

Y. Cooperii, Gabb; Proc. Cal. Acad., 1865, p. 189.

Y. Cooperii, Gabb; Pal. Cal., Vol. 2, p. 31, pl. 9, fig. 54.

Y. Cooperii, Cpr., Cooper; Enumerations West Coast Mollusca.

Miocene, between Martinez and Monte Diablo, Astoria; Pliocene, San Fernando; Post-Pliocene, San Pedro. Living.

PECTEN, Linn. *P. CERROSENSIS*, Gabb.

P. Cerrosensis, Gabb; Pal. Cal., Vol. 2, p. 32, pl. 9, fig. 55.

Post-Pliocene, Cerros Island, off Lower California.

P. PROPATULUS, Con.

P. propatulus, Con.; Wilkes's Exped., p. 726, pl. 18, fig. 13.

Miocene, Oregon; Griswold's, Tomales Bay.

P. CATILLIFORMIS, Con.

P. catilliformis, Con.; P. R. R. Rep., Vol. 5, p. 329, pl. 9, fig. 83.

Miocene, Ocoya Creek.

P. PABLOENSIS, Con.

P. Pabloensis, Con.; P. R. R. Rep., Vol. 6, p. 71, pl. 3, fig. 14.

Miocene, San Pablo, Martinez, Max Martinez Ranch.

P. PECKHAMI, Gabb.

P. Peckhami, Gabb ; Pal. Cal., Vol. 2, p. 59, pl. 16, fig. 19.
Miocene, San Pablo, Monterey County, Ojai Ranch.

P. PEDROANUS, Trask, sp.

Plagiostoma Pedroana, Trask ; Proc. Cal. Acad., Vol. 1, p. 86, pl. 3, fig. 1.
Plag. annulata, Trask ; *loc. cit.*, p. 86, pl. 3, fig. 2.
Plag. truncata, Trask ; *loc. cit.*, p. 86, pl. 3, fig. 3.
Pecten Pedroanus, Gabb ; Pal. Cal., Vol. 2, p. 60.
Miocene, San Pedro.

P. HASTATUS, Sby.

P. hastatus, Sby. ; Thes. Conch., 1847, p. 72, pl. 22, fig. 236.
P. hericeus, Gld. ; Proc. Bost. N. Hist. Soc., 1850, p. 236.
Id., Gld. ; Wilkes's Exped., p. 457, pl. 42, fig. 570.
P. altiplicatus, Con. ; P. R. R. Rep., Vol. 7, p. 191, pl. 3, fig. 2.
Post-Pliocene, Santa Barbara. Living.

P. ISLANDICUS, Müll.

P. Icelandicus, Müll. ; Zool. Dan., p. 248.
P. Islandicus, Chemn. ; Conch. Cab., Vol. 7, p. 65, fig. 615, 616.
P. Fabricii, Phil. ; Abbild., p. 3, (101) tab. 1, fig. 5.
P. Pealii, Con. ; Amer. Marine Conch., p. 12, pl. 2, fig. 3.
Post-Pliocene, Santa Barbara. Living.

P. VENTRICOSUS, Sby.

Pecten ventricosus, Sby. ; Thes. Conch., p. 51, pl. 12, fig. 18, 19, and 26.
P. tumidus, Sby. ; Proc. Zool. Soc., 1835, p. 109.
Post-Pliocene, San Pedro. Living.

JANIRA, Schum. **J. DENTATA**, Sby., sp.

Pecten dentatus, Sby. ; Thes. Conch., Vol. 1, p. 49, pl. 15, fig. 105, 106
Janira dentata, Cpr. ; Brit. Assn. Rep., W. C. Moll., 1863, p. 645.
Vola dentata, H. & A. Ad. ; Gen. R. Moll.
Pecten excavatus, Val. ; Voy. Venus, pl. 19, fig. 1.
Post-Pliocene, Santa Barbara. Living.

J. BELLA, Con.

Janira bella, Con. ; P. R. R. Rep., Vol. 6, p. 71, pl. 3, fig. 16.

Pliocene, Santa Barbara.

LIROPECTEN, Con. L. ESTRELLANUS, Con.

Pallium Estrellum, Con. ; P. R. R. Rep., Vol. 6, p. 71, pl. 3, fig. 15.

Liropecten Estrellanus, Con. ; Proc. Phil. Acad., 1862, p. 291.

Miocene, Estrella.

L. CRASSICARDO, Con.

Pallium crasscardo, Con. ; Proc. Phil. Acad., 1856, p. 313.

Liropecten crasscardo, Con. ; Proc. Phil. Acad., 1862, p. 291.

Spondylus Estrellanus, Con. ; P. R. R. Rep., Vol. 7, p. 191, pl. 1, fig. 3.

Miocene, Estrella ; Pliocene, Kirker's Pass, Santa Barbara, San Buenaventura, Ojai Ranch.

L. VOLÆFORMIS, Con.

Pallium Estrellum, Con. ; P. R. R. Rep., Vol. 7, p. 191, pl. 3, fig. 3, 4.

Not *P. Estrellum*, Con. ; P. R. R. Rep., Vol. 6, p. 71, pl. 3, fig. 15.

Liropecten volæformis, Con. ; Proc. Phil. Acad., 1862, p. 291.

Miocene, Estrella, and Valley of Nacismiento River.

L. VEATCHII, Gabb.

Pecten Veatchii, Gabb ; Pal. Cal., Vol. 2, p. 32, pl. 10, fig. 56.

Pliocene, Ojai Ranch ; Post-Pliocene, Cerros Island.

HINNITES, Defr. H. GIGANTEUS, Gray.

Hinnites giganteus, Gray ; A. Phil., 1826, p. 103.

Hinnita Poulsoni, Con. ; Jour. Phil. Acad., 1834, p. 152, pl. 14.

Hinnites crassa, Con. ; P. R. R. Rep., Vol. 7, p. 190, pl. 2, fig. 1, 2.

Post-Pliocene, Santa Barbara. Living.

ANOMIA, Linn. A. SUBCOSTATA, Con.

Anomia subcostata, Con. ; Proc. Phil. Acad., 1855, p. 267.

Id., Con. ; P. R. R. Rep., Vol. 5, p. 325, pl. 5, fig. 34.

Pliocene, Colorado Desert.

A. LAMPE, Gray.

Anomia lampe, Gray ; Proc. Zool. Soc., 1849, p. 115.

Post-Pliocene, San Pedro. Living.

OSTREA, O. BOURGEOISII, Rem.

Ostrea Bourgeoisii, Rém. ; Proc. Cal. Acad., 1863, p. 13.

Id., Gabb ; Pal. Cal., Vol. 2, p. 33, pl. 11, fig. 57.

Pliocene, Kirker's Pass.

O. ATTWOODII, Gabb.

Ostrea Attwoodii, Gabb ; Pal. Cal., Vol. 2, p. 33, pl. 10, fig. 58 ; pl. 11, fig. 58 b.

Miocene or Pliocene, (?) San Lorenzo Valley, Monterey County.

O. TAYLORIANA, Gabb.

Ostrea Tayloriana, Gabb ; Pal. Cal., Vol. 2, p. 34, pl. 12, fig. 60.

Miocene, Santa Inez Mts., near Santa Barbara.

O. VEATCHII, Gabb.

Ostrea Veatchii, Gabb ; Pal. Cal., Vol. 2, p. 34, pl. 11, fig. 59.

Post-Pliocene, Cerros Island, and near Loreto, Lower California.

O. CERROSENSIS, Gabb.

Ostrea Cerrosensis, Gabb ; Pal. Cal., Vol. 2, p. 35, pl. 11, fig. 61.

Compare *O. gallus*, Val. ; Voy. Venus.

Post-Pliocene, Cerros Island.

I have received from Prof. Raimondi, of Lima, Peru, an oyster from the late Tertiary deposits of Payta, which leads me to suspect the specific identity of *Cerrosensis* with the form figured by Valenciennes in the Voyage of the Venus, under the name of *O. gallus*. The only important difference is in size. The Peruvian fossil agrees in size with the figure of the recent form ; while my fossil is not more than half as large. Should no other characters show themselves, *gallus* will have to stand as the name of the species.

O. LURIDA, Cpr.

O. lurida, Cpr. ; Rep. on West Coast Mollusca, 1863, p. 645.

Post-Pliocene, Benicia. Living.

O. VESPERTINA, Con.

Ostrea vespertina, Con.; Jour. Phil. Acad., 2 Ser., Vol. 2, p. 300.

O. vespertina, Con.; P. R. R. Rep., Vol. 5, p. 325, pl. 5, fig. 36, 38.

Pliocene, Colorado Desert, Santa Barbara.

O. HEERMANNI, Con.

Ostrea Heermanni, Con.; Proc. Phil. Acad., 1855, p. 267.

O. Heermanni, Con.; P. R. R. Rep., Vol. 5, p. 326.

Pliocene, Colorado Desert.

O. TITAN, Con.

Ostrea Titan, Con.; P. R. R. Rep., Vol. 6, p. 72, pl. 4, fig. 17; pl. 5, fig. 17 a.

Miocene, Kirker's Pass, South of Mount Diablo, Walnut Creek, Estrella, San

Luis Obispo, Ojai Ranch, Cuyama R. Cañon, Tulare Valley, and throughout the Coast Range wherever the Upper Miocene is found.

TAMIOSOMA, Con. T. GREGARIA, Con.

Tamiosoma gregaria, Con.; Proc. Phil. Acad., 1856, p. 315.

Tamiosoma gregaria, Con.; P. R. R. Rep., Vol. 6, p. 72, pl. 4, fig. 18.

Balanus Estrellanus, Con.; P. R. R. Rep., Vol. 7, p. 195, pl. 8, fig. 1.

Radiolites gregaria, Con.; Proc. Phil. Acad., 1864, p. 214.

Tamiosoma gregaria, Gabb; Pal. Cal., Vol. 2, p. 61, pl. 18, fig. 22, a, b, c, d

Miocene, Estrella, Santa Marguerita Ranch, Tulare Valley.

POLYZOA.

CELLEPORA, Fabr., Auct. C. CALIFORNIENSIS, G. & H.

Cellepora Californiensis, Gabb & Horn.; Jour. Phil. Acad., 1862, p. 130, fig. 12.

Post-Pliocene, Santa Barbara. Living.*

* All the Polyzoa in this list are from the Post-Pliocene marl of Santa Barbara. Most of them, if not all, have been found living on the coast, and I have made extensive collections of the recent Pacific forms, which, to my great regret, I have not been able to study, partly for want of time, and partly because my eyes will not permit the use of the microscope. My friend, Dr. S. B. Howell, Secretary of the Philadelphia Academy of Natural Sciences, has kindly undertaken the work, and I trust that his results will be as useful as the subject is interesting. I have retained here the Orbignyan generic names and classification, simply as a matter

C. BELLEROPHON, G. & H.

C. bellerophon, G. & H., *op. cit.*, p. 132, fig. 13.

REPTESCHARELLA, d'Orb. R. HEERMANNII, G. & H.

R. Heermannii, G. & H.; *op. cit.*, p. 137, fig. 20.

R. PLANA, G. & H.

R. plana, G. & H.; *op. cit.*, p. 137, fig. 21.

PHIDOLOPORA, G. & H. P. LABIATA, G. & H.

Phidolopora labiata, G. & H.; *op. cit.*, p. 138, fig. 21.

REPTOPORINA, d'Orb. R. EUSTOMATA, G. & H.

R. eustomata, G. & H.; *op. cit.*, p. 144, fig. 26.

REPTESCHARELLINA, d'Orb. R. DISPARILIS, G. & H.

R. disparilis, G. & H.; *op. cit.*, p. 147, fig. 29.

? R. HEERMANNII, G. & H.

? *R. Heermannii*, G. & H.; *op. cit.*, p. 147, fig. 30.

R. CORNUTA, G. & H.

R. cornuta, G. & H.; *op. cit.*, p. 147, fig. 31.

SIPHONELLA, Hagen. S. MULTIPORA, G. & H.

S. multipora, G. & H.; *op. cit.*, p. 154, fig. 38.

MEMBRANIPORA, Blainv. M. CALIFORNICA, G. & H.

M. Californica, G. & H.; *op. cit.*, p. 160, fig. 46.

of convenience; though I am satisfied that that author's divisions are eminently artificial. A more extensive acquaintance with the subject, based on a study of living as well as fossil forms, has satisfied me of the fallacy of his system, founded on partial characters derived from the skeletons alone.

M. BARBARENSIS, G. & H.

M. Barbarensis, G. & H. ; *op. cit.*, p. 160, fig. 47.

IDMONEA, Lamx. I. CALIFORNICA, Con.

Idmonea Californica, Con. ; Proc. Phil. Acad., 1855, p. 441.

Id., G. & H. ; *op. cit.*, p. 168, fig. 56.

SEMITUBIGERA, d'Orb. S. TUBA, G. & H.

S. tuba, G. & H. ; *op. cit.*, p. 169, fig. 57.

ENTALOPHORA, Lamx. E. PUNCTULATA, G. & H.

E. punctulata, G. & H. ; *op. cit.*, p. 171, fig. 61.

LICHENOPORA, Defr. L. CALIFORNICA, Con.

L. Californica, Con. ; Proc. Phil. Acad., 1855, p. 441.

Id., G. & H. ; *op. cit.*, p. 176, fig. 68.

RADIATA.

CLYPEASTER, Lam. C. GABBII, Rém.

Clypeaster Gabbii, Rém. ; Proc. Cal. Acad., 1863, p. 53.

Id., Gabb ; Pal. Cal., Vol. 2, p. 12, fig. 64, 64 a.

Miocene, San Pablo, Martinez, Walnut Creek, and vicinity of Mount Diablo.

ECHINARACHNIUS, Van Phels. E. BREWERIANUS, Rém.

E. Brewerianus, Rém. ; *loc. cit.*, 1863, p. 53.

Id., Gabb ; Pal. Cal., Vol. 2, pl. 12, fig. 65.

Miocene, Walnut Creek.

SCUTELLA, Lam. S. GIBBSII, Rém.

Scutella Gibbsii, Rém. ; *loc. cit.*, p. 13.

Id., Gabb ; Pal. Cal., Vol. 2, pl. 13, fig. 66.

Miocene, near Buena Vista Lake.

S. STRIATULA.

S. striatula, P. R. R. Rep., Vol. 7, pl. 19, fig. 1.

Post-Pliocene, Santa Barbara, San Pedro, Seven Mile Beach, near San Francisco. Living.

S. INTERLINEATA, Stimpson.

Scutella interlineata, St. ; P. R. R. Rep., Vol. 5, p. 153, pl. 4, fig. 30.

Pliocene, Seven Mile Beach, near San Francisco.

ASTRODAPSIS, Con. A. ANTISELLI, Con.

Astrodapsis antiselli, Con. ; P. R. R. Rep., Vol. 7, p. 196, pl. 10, fig. 1, 2.

Miocene, near Buena Vista Lake.

A. WHITNEYI, Rém.

Astrodapsis Whitneyi, Rém. ; Proc. Cal. Acad., 1863, p. 52.

Id., Gabb ; Pal. Cal., Vol. 2, pl. 13, fig. 67.

Pliocene, Kirker's Pass.

A. TUMIDUS, Rém.

A. tumidus, Rém. ; Proc. Cal. Acad., 1863, p. 52.

Id., Gabb ; Pal. Cal., Vol. 2, pl. 13, fig. 68.

ASTERIAS, Linn. A. RÉMONDI, Gabb.

Asterias Rémondi, Gabb ; Pal. Cal., Vol. 2, p. 37, pl. 13, fig. 69.

Miocene, Star Fish Point, West of Martinez.

SPECIES

NOT YET ENCOUNTERED OR RECOGNIZED.

CALLIANASSA, Leach. C. OREGONENSIS, Dana.

Callianassa Oregonensis, Dana ; Wilkes's Exped., p. 722, pl. 17, fig. 3.
Miocene, Oregon.

MUREX, Linn. M. FRAGILIS, Trask.

Id., Trask ; Proc. Cal. Acad. Nat. Sci., 1855, p. 42.
Post-Pliocene, Santa Barbara.

FUSUS, Lam. F. ARCTATUS, Con., sp.

Colus arctatus, Con. ; P. R. R. Rep., Vol. 5, p. 329, pl. 8, fig. 76.
Fusus arctatus, Meek ; Smithsonian Check List, No. 749.

F. BARBARENSIS, Trask.

Id., Trask ; Proc. Cal., Acad. Nat. Sci., 1855, p. 42.
Post-Pliocene, Santa Barbara.

F. ROBUSTUS, Trask.

Id., Trask ; *loc. cit.*
Post-Pliocene, Santa Barbara.

F. RUGOSUS, Trask.

Id., Trask ; *loc. cit.*
Post-Pliocene, Santa Barbara.

BUSYCON. ? B. OREGONENSIS, Con., sp.

Fusus id, Con. ; Amer. Jour. Sci., 1848, p. 433, fig. 13.
Sycotypus id., Con. ; Jour. Conch., 1865, p. 151.
Busycon ? id., Meek ; Sm. Check List, No. 743.
Miocene, Astoria.

PRISCOFUSUS, Con. P. CORPULENTUS, Con.

Fusus corpulentus, Con. ; Wilkes's Exped., p. 728, pl. 20, fig. 4.

Priscofusus id., Con. ; Jour. Conch., 1865, p. 150.

Miocene, Astoria.

P. DEVINCTUS, Con.

Buccinum devinctum, Con. ; Wilkes's Exped., p. 728, pl. 20, fig. 2.

Priscofusus id., Con. ; Jour. Conch., 1865, p. 150.

Miocene, Astoria.

P. MEDIALIS, Con.

Cerithium mediale, Con. ; Wilkes's Exped., p. 728, pl. 20, fig. 1.

P. medialis, Con. ; Jour. Conch., 1865, p. 150.

Miocene, Astoria.

P. NODIFERUS, Con.

Indet., Con. ; Wilkes's Exped., pl. 20, fig. 12.

P. nodiferus, Con. ; Jour. Conch., 1865, p. 150.

Miocene, Astoria.

P. OREGONENSIS, Con.

Indet., Con. ; Wilkes's Exped., pl. 20, fig. 10, 11.

P. Oregonensis, Con. ; Jour. Conch., 1865, p. 150.

Miocene, Astoria.

PLEUROTOMA, Lam. P. TRANSMONTANA, Con.

P. transmontana, Con. ; P. R. R. Rep., Vol. 5, p. 328, pl. 7, fig. 69.

Turris id., Meek ; Smithsonian Check List, No. 693.

Miocene, Ocoya Creek.

PURPURA, Brug. P. PETROSA, Con. sp.

Stramonita petrosa, Con. ; P. R. R. Rep., Vol. 5, p. 327, pl. 6, fig. 47

Purpura id., Meek ; Smithsonian Check List, No. 663.

GALEODEA, Link. G. PETROSA, Con.

G. petrosa, Con. ; Smithsonian Eocene Check List, No. 471.

"Oregon."

The above list gives no means of determining where this species was described; and I can find no form to which to refer it, unless it be one of the succeeding, both of which have been placed under the same specific name.

CASSIDEA, Swains. C. ? BILIRATA, Con., sp.

Semicassis ? biliratus, Con. ; Sm. Check List (1866), No. 472.

Doliopsis id., Con. ; Jour. Conch., 1865, p. 150.

Dolium petrosum, Con. ; (*pars*) Wilkes's Exped., p. 727, pl. 19, fig. 4.

Miocene, Oregon.

C. ? PETROSA, Con., sp.

Semicassis petrosus, Con. ; Sm. Check List, No. 474.

Doliopsis id., Con. ; Jour. Conch., 1865, p. 150.

Dolium id., Con. ; Wilkes's Exped. (*pars*), p. 727, pl. 19, fig. 3, 5.

Miocene, Oregon.

FICOPSIS, Con. F. MODESTA, Con., sp.

Pyrgula modesta, Con. ; Am. Jour. Sci., 1848, p. 433, fig. 12.

Sycotypus id., Con. ; Jour. Conch., 1865, p. 151.

Ficus id., Meek ; Sm. Check List, Miocene, No. 637.

Ficopsis id., Con. ; Sm. Check List, Eocene, No. 479.

Miocene, Oregon.

FICUS, Bolt. F. OCOYANUS, Con., sp.

Sycotypus Ocoyanus, Con. ; P. R. R. Rep., Vol. 5, p. 329, pl. 7, fig. 72.

Ficus id., Meek ; Sm. Check List, Miocene, No. 635.

Miocene, Ocoya Creek.

NATICA, Brug. N. GENICULATA, Con.

Id., Con. ; P. R. R. Rep., Vol. 5, p. 328, pl. 7, fig. 67.

Miocene, Ocoya Creek.

It is not impossible that this may prove to be identical with *Agasoma gravida*, but the figure in the Pacific Railroad Report is so very uncharacteristic, that I have been unable to arrive at a satisfactory opinion on the subject.

LUNATIA, Gray. **L. OREGONENSIS**, Con.

L. Oregonensis, Con.; Jour. Conch., 1865, p. 151.

Sigaretus scopulosus, Con.; (*pars*) Wilkes's Exped., pl. 19, fig. 6, *b, c*.

Miocene, Oregon.

SINUM, Bolt. **S. SCOPULOSUM**, Con., sp.

Sigaretus scopulosus, Con.; Wilkes's Exped., p. 727, pl. 19, fig. 6 (exclus. *b, c*).

Catinus scopulosus, Con.; Jour. Conch., 1865, p. 151.

Catinus scopulosus, Con.; Sm. Check List, No. 469.

Catinus scopulosus, Con.; (in Meek), Miocene Check List.

Mr. Meek calls this shell *Catinus*, by request of Mr. Conrad, but under protest, and quotes *Sinum* as the more correct name.

Miocene, Oregon.

TURBONILLA, Risso. **T. PAPILLOSA**, Trask, sp.

Chemnitzia papillosa, Trask; Proc. Cal. Acad., 1855, p. 41.

Turbonilla papillosa, Meek; Sm. Check List, No. 592.

Post-Pliocene, Santa Barbara.

CANCELLARIA, Lam. **C. ? OREGONENSIS**, Con.

? *C. Oregonensis*, Con.; Jour. Conch., 1865, p. 151.

Indet., Con.; Wilkes's Exped., pl. 20, fig. 8.

Miocene, Astoria.

CERITHIOPSIS, Fbs. & Hanley. **? C. OREGONENSIS**, Con.

Cerithiopsis ? Oregonensis, Con.; Jour. Conch., 1865, p. 151.

Indet., Con.; Wilkes's Exped., pl. 20, figs. 13, 14.

Miocene, Astoria.

TURRITELLA, Lam. **T. OCOYANA**, Con.

T. Ocoyana, Con.; P. R. R. Rep., Vol. 5, p. 329, pl. 8, fig. 72.

Miocene, Ocoya Creek.

MESALIA, Gray. **M. ARENICOLA**, Con.

M. arenicola, Con.; Sm. Check List, Eocene, No. 326.

I know nothing of this shell, except that I find it quoted as above and referred to "Oregon."

TROCHITA, Schum. T. DIEGOANA, Con.

T. Diegoana, Con. ; P. R. R. Rep., Vol. 5, p. 327, pl. 5, fig. 42.

Miocene, San Diego.

CRYPTA, Humph. C. ROSTRALIS, Con.

C. rostralis, Con. ; Jour. Conch., 1865, p. 151.

Indet, Con. ; Wilkes's Exped., 1850, pl. 19, fig. 11.

Probably the same as *C. rostriformis*, Gld. ; Proc. Bost. N. Hist. Soc., 1846, p. 160, and *C. rostriformis*, Gld. ; Wilkes's Exped., Mollusca, p. 375, pl. 32, fig. 482.

Miocene, Astoria.

VANIKORO, Quoy & Gaim. ? V. DIEGOANA, Con., sp.

Narica Diegoana, Con. ; P. R. R. Rep., Vol. 5, p. 326, pl. 5, fig. 39.

Vanikoro Diegoana, Meek ; Check List, Miocene, No. 498.

Miocene, San Diego.

CEMORIA, Leach. C. CRUCIBULIFORMIS, Con.

Diadora crucibuliformis, Con. ; Proc. Phil. Acad., 1855, p. 267.

Id., Con. ; P. R. R. Rep., Vol. 6, p. 73, pl. 5, fig. 23.

Cemoria id., Con. ; in Meek's Check List, No. 467.

Post-Pliocene, Santa Barbara. Living.

DENTALIUM, Linn. D. SUBSTRIATUM, Con., sp.

Teredo substriata, Con. ; Wilkes's Exped., 1850, p. 728, pl. 20, fig. 7.

Dentalium substriatum, Woodw. ; Brit. Assn. Rep., 1856.

Dentalium substriatum, Con. ; Jour. Conch., 1865, p. 151.

Miocene, Astoria, Oregon.

ACTÆON, Montf. A. ELLIPTICUS, Trask, sp.

Tornatella elliptica, Trask ; Proc. Cal. Acad., 1855, p. 42.

Actæon elliptica, Meek ; Check List, No. 434.

Post-Pliocene, Santa Barbara.

CYLICHNA, Loven. C. OREGONA, Con.

C. Oregona, Con. ; Jour. Conch., 1865, p. 151.

Bulla petrosa, Con. ; Wilkes's Exped., p. 727, pl. 19, fig. 8.

Miocene, Astoria.

C. PETROSA, Con.

C. petrosa, Con. ; Jour. Conch., 1865, p. 151.

Bulina petrosa, Con. ; Am. Jour. Sci., 1848, p. 433, fig. 11.

Miocene, Oregon.

BULLA, Linn. B. JUGULARIS, Con.

B. jugularis, Con. ; P. R. R. Rep., Vol. 5, p. 328, pl. 7, fig. 62.

Miocene, Ocoya Creek.

ACEPHALA.**ENSIS, Schum. E. CURTUS, Con.**

Solen curtus, Con. ; Am. Jour. Sci., 1848, p. 433, fig. 13.

Ensis curtus, Con. ; Jour. Conch., 1865, p. 152.

Plectosolen curtus, Con. ; Sm. Check List, No. 239.

Miocene, Oregon.

SAXICAVA, Fleur. S. ABRUPTA, Con.

S. abrupta, P. R. R. Rep., Vol. 5, p. 324, pl. 3, fig. 25.

Post-Pliocene, San Pedro.

MYA, Linn. M. MONTEREYANA, Con.

Mya montereyana, Con. ; P. R. R. Rep., Vol. 6, p. 70, pl. 2, fig. 4

Probably = *Cryptomya californica*.

M. SUBSINUATA, Con.

Mya subsinuata, Con. ; P. R. R. Rep., Vol. 7, p. 72, pl. 2, fig. 5.

Probably also = *Cryptomya californica*.

CORBULA, Brug. C. DIEGOANA, Con

Corbula diegoana, Con. ; P. R. R. Rep., Vol. 5, p. 322, pl. 3, fig. 16.

Post-Pliocene, San Diego.

C. EVANSANA, Shum.

Corbula Evansana, Shum. ; Tr. St. Louis Acad., Vol. 1, p. 120.
Miocene, Port Orford, Oregon.

THRACIA, Leach. T. MACTROPSIS, Con.

Thracia mactropsis, Con. ; P. R. R. Rep., Vol. 6, p. 69, pl. 2, fig. 3.
" Monterey County, California."

PANDORA, Brug. P. BILIRATA, Con.

P. bilirata, Con. ; P. R. R. Rep., Vol. 6, p. 73, pl. 5, fig. 25.
Santa Barbara.

MACTRA, Linn. M. GABIOTENSIS, Con.

Maetra Gabiotensis, Con. ; P. R. R. Rep., Vol. 7, p. 194, pl. 7, fig. 3.
Miocene, Gaviota Pass.

LUTRARIA, Lam. L. TRANSMONTANA, Con.

Lutraria transmontana, Con. ; P. R. R. Rep., Vol. 7, p. 194, pl. 5, fig. 6.
Los Angeles County.

TELLINA, Linn. T. DIEGOANA, Con.

Tellina Diegoana, Con. ; P. R. R. Rep., Vol. 5, p. 323, pl. 3, fig. 28.
San Diego.

T. OBRUTA, Con.

Tellina obruta, Con. ; Am. Jour. Sci., 1848, p. 436, fig. 6.
Miocene, Oregon.

T. ALBARIA, Con.

Tellina albaria, Con. ; Wilkes's Exped., p. 725, pl. 18, fig. 5.
Miocene, Oregon.

T. BITRUNCATA, Con.

Tellina bitruncata, Con. ; Wilkes's Exped., p. 725.
Oregon.

ARCOPAGIA, Leach. *A. UNDA*, Con.

Arcopagia unda, Con. ; P. R. R. Rep., Vol. 7, p. 192, pl. 4, fig. 34.

Miocene, Santa Barbara, Estrella.

MACOMA, Leach. *M. OCOYANA*, Con., sp.

Tellina Ocoyana, Con. ; P. R. R. Rep., Vol. 5, p. 329, pl. 7, fig. 75.

Miocene, Ocoya Creek.

M. ARCTATA, Con., sp.

Tellina arctata, Con. ; Wilkes's Exped., p. 725, pl. 18, fig. 3.

Miocene, Oregon.

VENUS, Linn. *V. PAJAROENSIS*, Con.

Venus Pajaroensis, Con. ; P. R. R. Rep., Vol. 7, p. 192, pl. 4, fig. 1, 2.

Pajaro, near San Juan Bautista.

CHIONE, Megerle. *C. ANGUSTIFRONS*, Con.

Venus angustifrons, Con. ; Wilkes's Exped, p. 724, pl. 17, fig. 11.

Dione angustifrons, Con. ; Jour. Conch., 1865, p. 152.

Miocene, Astoria.

C. VESPERTINA; Con., sp.

Cytherea vespertina, Con. ; Am. Jour. Sci., 1848, p. 432, fig. 9.

Dione vespertina, Con. ; Jour. Conch., 1865, p. 152.

Miocene, Oregon.

MERETRIX, Lam. *M. UNIOMERIS*, Con.

Meretrix uniomeris, Con. ; P. R. R. Rep., Vol. 5, p. 323, pl. 3, fig. 20.

Miocene, Tres Pinos, Monterey County.

M. DECISA, Con.

Meretrix decisa, Con. ; P. R. R. Rep., Vol. 5, p. 323, pl. 3, fig. 27.

Miocene, Ocoya Creek.

M. TULARANA, Con.

Meretrix Tularana, Con.; P. R. R. Rep., Vol. 5, p. 323, pl. 3, fig. 22.
? Miocene, San Emidio.

PACHYDESMA, Con. P. INEZANA, Con.

Pachydesma Inezana, Con.; P. R. R. Rep., Vol. 7, p. 197, pl. 5, fig. 204.
Miocene, Santa Inez Mountains.

DOSINIA, Scop. ? D. LONGULA, Con.

Dosinia longula, Con.; Proc. Phil. Acad., 1856, p. 313.
Id., Con.; P. R. R. Rep., Vol. 6, p. 71.
Id., Con.; P. R. R. Rep., Vol. 7, p. 193, pl. 7, fig. 2.
Miocene, Salinas Valley.
This shell certainly does not look like a *Dosinia*.

D. MONTANA, Con.

Dosinia montana, Con.; P. R. R. Rep., Vol. 7, p. 194, pl. 6, fig. 4.
Miocene, same locality.

D. SUBOBLIQUA, Con.

Dosinia subobliqua, Con.; P. R. R. Rep., Vol. 7, p. 194, pl. 6, fig. 5.
Miocene, same locality.

TAPES, Megerle. T. MONTANA, Con.

Tapes montana, Con.; P. R. R. Rep., Vol. 7, p. 192, pl. 5, fig. 3 and 5.
San Buenaventura.

T. INEZENSIS, Con.

T. Inezensis, Con.; P. R. R. Rep., Vol. 7, p. 192, pl. 7, fig. 1.
Miocene, Santa Inez Mountains.

PETRICOLA, Lam. P. PEDROANA, Con.

Petricola Pedroana, Con.; P. R. R. Rep., Vol. 5, p. 324, pl. 3, fig. 24.
San Pedro.

CARDIUM, Linn. **C. MODESTUM**, Con.

C. modestum, Con. ; P. R. R. Rep., Vol. 5, p. 322, pl. 3, fig. 15.
San Diego.

LUCINA, Brug. **L. FIBROSA**, Shum.

Lucina fibrosa, Shum ; Tr. St. Louis Acad., Vol. 1, p. 120.
Cyclas fibrosa, Con. ; Jour. Conch., 1865, p. 153.
Port Orford, Oregon.

L. PERMACRA, Con.

Cyclas (Lucina) permacra, Con. ; P. R. R. Rep., Vol. 7, p. 192, pl. 7, fig. 4.
Santa Monica.

L. ESTRELLANA, Con.

Cyclas (L.) Estrellana, Con. ; P. R. R. Rep., Vol. 7, p. 192, pl. 6, fig. 6.
Miocene, Estrella.

MYTILUS, Linn. **M. PEDROANUS**, Con.

M. Pedroanus, Con. ; P. R. R. Rep., Vol. 5, p. 325, pl. 5, fig. 40.
? Post-Pliocene, San Pedro.

M. INEZENSIS, Con.

M. Inezensis, Con. ; P. R. R. Rep., Vol. 7, p. 194, pl. 8, fig. 2, 3.
Miocene, Santa Inez Mountains.

MODIOLA, Lam. **M. CONTRACTA**, Con.

Modiola contracta, Con. ; P. R. R. Rep., Vol. 5, p. 325, pl. 5, fig. 25.
"Sixteen miles south of Tres Pinos, Monterey County," on the San Benito.

PERNA, Brug. **P. MONTANA**, Con.

Perna montana, Con. ; P. R. R. Rep., Vol. 7, p. 195.
San Buenaventura.

ARCA, Linn. . **A. DEVINCTA**, Con.

Arca devincta, Con. ; Wilkes's Exped., p. 726, pl. 18, fig. 10.

Anomalocardia id., Con. ; Jour. Conch., p. 153.

? *A. microdonta*, Con. ; see note under that species in preceding list.

Miocene, Oregon.

A. OBISPOANA, Con.

Arca Obispoana, Con. ; P. R. R. Rep., Vol. 7, p. 192, pl. 5, fig. 1.

San Louis Obispo.

A. CONGESTA, Con.

Arca congesta, Con. ; P. R. R. Rep., Vol. 6, p. 72, pl. 2, fig. 10.

"California."

LIMOPSIS, Sassi. **L. NITENS**, Con,

Pectunculus nitens, Con. ; Wilkes's Exped., p. 726, pl. 18, fig. 8.

Limopsis id., Con. ; Jour. Conch., 1865, p. 163.

Miocene, Oregon.

L. OREGONENSIS, Con.

Indet., Con. ; Wilkes's Exped., pl. 18, fig. 11.

Limopsis Oregonensis, Con. ; Jour. Conch., 1865, p. 153.

Miocene, Oregon.

LEDA, Schum. **L. OREGONA**, Shum.

Leda Oregona, Shum. ; Trans. St. Louis Acad., Vol. 1, p. 121.

Neilo id., Con. ; Jour. Conch., 1865, p. 153.

Nuculana id., Con. ; Check List Eocene, No. 49.

Miocene, Oregon.

L. PENITA, Con., sp.

Nucula penita, Con. ; Am. Jour. Sci., 1848, p. 433, fig. 10.

Neilo penita, Con. ; Jour. Conch., 1865, p. 153.

Nuculana penita, Con. ; Check List Eocene, No. 51.

Miocene, Oregon.

L. WILLAMETTENSIS, Shum. .

Leda Willamettensis, Shum. ; Tr. St. Louis Acad., Vol. 1, p. 121.

Neilo Willamettensis, Con. ; Am. Jour. Conch, 1865, p. 153.

Nuculanu Willamettensis, Con. ; Check List Eocene, No. 59.

Miocene, Oregon.

NEILO, H. & A. Ad. N. ABRUPTA, Con.

Nucula abrupta, Con. ; Am. Jour. Sci., 1848, p. 433, fig. 3.

Neilo abrupta, Con. ; Jour. Conch., 1865, p. 153.

Miocene, Oregon.

PECTEN, Linn. P. COOSENSIS, Shum.

P. Coosensis, Shum. ; Tr. St. Louis Acad., Vol. 1, p. 122.

Miocene, Coos Bay, Oregon.

Compare *P. propatulus*, Con.

P. DESERTI, Con.

P. Deserti, Con. ; P. R. R. Rep., Vol. 5, p. 325, pl. 5, fig. 41.

Pliocene, Colorado Desert.

P. NEVADANUS, Con.

P. Nevadanus, Con. ; P. R. R. Rep., Vol. 5, p. 329, pl. 8, fig. 27.

Miocene, Ocoya Creek.

P. MEEKII, Con.

P. Meekii, Con. ; P. R. R. Rep., Vol. 7, p. 190, pl. 1, fig. 1.

San Rafael Hills.

P. DISCUS, Con.

P. discus, Con. ; P. R. R. Rep., Vol. 7, p. 190, pl. 3, fig. 1.

Santa Inez.

P. MAGNOLIA, Con.

P. magnolia, Con. ; P. R. R. Rep., Vol. 7, p. 191, pl. 1, fig. 2.

Santa Inez.

OSTREA, Linn. **O. SUBJECTA**, Con.

Ostrea subjecta, Con. ; P. R. R. Rep., Vol. 7, p. 193, pl. 2, fig. 3.
Sierra Monica, Miocene ?

O. PANZANA, Con.

Ostrea Panzana, Con. ; P. R. R. Rep., Vol. 7, p. 193, pl. 2, fig. 4.
Panza Valley and Estrella, Miocene.

TEREBRATULA, Lihyd. ? **T. NITENS**, Con.

Terebratula nitens, Con. ; Wilkes's Exped., p. 726, pl. 19, fig. 1.
Rhynchonella nitens, Con. ; Jour. Conch., 1865, p. 154.
Miocene, Astoria.

RADIATA.**GALERITES**. **G. OREGONENSIS**, Dana.

Galerites Oregonensis, Dana ; Wilkes's Exped., p. 729, pl. 21, fig. 5, 6.
Miocene, Oregon.

ADDITIONS AND CORRECTIONS.

Since the preceding pages were stereotyped, the following additions and corrections have been obtained from my friends Messrs. Tryon and Stearns, who have examined the proof sheets. I have also detected two or three omissions, which are here corrected.

TROPHON squamulifer, Cpr. Found by Mr. Stearns, living at Monterey and Catalina Island ; common.

NEPTUNEA lirata, Mart., Alaska ; a large series has been compared by Stearns and Morse with *N. decemcostata*, and they consider them identical ; circumboreal.

MARGARITA salmonea, Cpr. "Is not worth a *variety* distinction from *pupilla*." (Stearns.)

CLYPIDELLA bimaculata, Dall. Is now considered by Stearns and Carpenter, to be identical with *callomarginata*, after a comparison of a large suite of shells and animals.

ZIRPHÆA, Leach.

Z. DENTATA, Gabb.

Z. dentata, Gabb; Pal. Cal., Vol. 2, p. 18, pl. 3, fig. 31 *a*.
Pliocene, Kirker's Pass.

MACOMA, Leach.

M. CALCAREA, Chemn., sp.

Tellina calcarea, Chemn.; Conch. Cab., Vol. 6, p. 140, fig. 136.
T. inconspicua, Brod. and Sby; Zool. Jour., Vol. 4, p. 363.
Sanguinolaria Californica, Con.; Jour. Phil. Acad., 1 Ser., Vol. 7, p. 231,
pl. 17, f. 11.
Tellina lata, Gmel.; Syst. Nat., p. 3237.
T. proxima, Brown; Zool. Beechey's Voy., p. 154, pl. 44, fig. 4.
T. Pedroana, Con.; Pacific R. R. Rep., Vol. 5, p. 323, pl. 3, fig. 17.
T. sordida, Couth.; Bost. Jour., Vol. 2, p. 59, pl. 3, fig. 11.
T. tenera, Leach; Appendix to Ross's Voyage.
Macoma Pedroana, Gabb; Vol. 2, p. 94.
Mac. inconspicua, Cpr.; Brit. Assn. Rep., 1863.
Circumboreal; fossil in the Post Pliocene of San Pedro.

ARCA, Lam.

A. SULCICOSTA, Gabb.

Arca sulcicosta, Gabb; Pal. Cal., Vol. 2, p. 31, pl. 9, fig. 53, 53 *a*.
Pliocene, Mark West Creek, near Sta. Rosa.

MORRISIA, Davidson.

M. HORNII, Gabb.

Morrisia Hornii, Gabb; Proc. Phil. Acad., 1861, p. 371.
Id., Gabb; Pal. Cal., Vol. 2, p. 36, pl. 12, fig. 63.
Post Pliocene, Sta. Barbara.

PALÆONTOLOGY OF CALIFORNIA.

VOL. II.

SECTION II.

CRETACEOUS FOSSILS.

PART I.

DESCRIPTION OF NEW SPECIES.

(CONTINUED FROM VOL. I.)

CRUSTACEA.

CRUSTACEAN remains are extremely rare in the California Cretaceous; fragments of but three species having yet been encountered. Pl. 19, fig. 1, represents a carapace of a small crab, a unique specimen from Martinez, discovered by Mr. Mathewson, in a coarse-grained gray sandstone. Figures 2, *a-f*, are three fragments of claws, remarkable for their long, slender form. Dr. Stimpson concurs with me in the belief that they all belong to the same species, though they vary much both in size and shape. They are from a dense gray claystone, associated with *Ptiloteuthis foliatus* and *Diptyhoceras lævis*, from the vicinity of Cottonwood Creek, Shasta County.

CALLIANASSA, Leach.

C. STIMPSONII, Gabb.

Pl. 19, Fig. 3.

(*Callianassa Stimpsonii*, Gabb; Pal. Cal., Vol. 1, p. 57, pl. 9, fig. 1, *a, b, c.*)

Figure 1 *b*, above quoted, was unfortunately so misrepresented by the artist as not only to be unrecognizable, but also to give an entirely incorrect idea of the shape. This was due to the original drawing representing the two upper angles broken away, and the lithographer having substituted a curved line in the place of the broken one in my drawing. The present figure is from the same sketch, with the sole addition of the probable outline being restored.

MOLLUSCA.

CEPHALOPODA.

PTILOTEUTHIS, *N. Gen.*

ELONGATE, subovate, very thin, anterior end broadly angulated, no mid-rib; slipper either minute or wanting. Surface marked by numerous, irregular, small wrinkles, which radiate backwards and outwards, partly from the anterior end and partly from an imaginary median line.

The present anomalous form cannot be confounded with any previously-described genus. *Beloteuthis* and *Phylloteuthis* are narrow in front, and enlarge more or less behind, and both have a mid-rib. *Beloteuthis* has straight radiating lines, all diverging from the anterior end, and these are usually crossed by concentric lines or undulations; *Phylloteuthis* has a very narrow anterior end, a mid-rib, and well-marked, straight, rigid, lateral striæ diverging at a broad angle from the mid-rib alone. *Coccoteuthis* has a thick substance, and the surface is strongly pustulated. *Ptiloteuthis* is very thin; the lines or wrinkles, about twice as wide apart as the thickness of the shell-substance, branch and anastomose among themselves, and radiate in part from the anterior end, but in part diverge from a central line occupying the proper position for a mid-rib, but only marked by the change in the direction of the striæ. The anterior end terminates in an angle of about 60°, and the slipper, if it ever existed, was so small as to be barely more than rudimentary.

P. FOLIATUS, n. s.

Pl. 19, Fig. 4.

SHELL thin, elongated, subovate; anterior end angulated, the sides rounding and rapidly widening, merging into the lateral margins, which are broadly convex, nearly parallel; posterior

end unknown, the terminal portion being very much broken in the only specimen I have seen. From the median line, the position of the mid-rib in most of these shells, the wrinkles diverge backwards and outwards at an angle of about 25° , curving more outwardly as they approach the margin; these wrinkles are acute on the dorsal face of the shell, and inclose concave interspaces of very variable length; the longest lines, which originate at the anterior end of the shell, reach the margins about midway between the two extremities.

Length, 3 inches +; width, 1.2 inches in the middle; the total length seems to have been from 3.3 to 3.5 inches. Thickness apparently not more than .01 inch, as exposed by several fractures.

Locality: Shasta Group,* Cottonwood Creek, Shasta County. A single specimen in my cabinet, found by Mr. Mathewson.

BELEMNITES IMPRESSUS, Gabb.

This is the only cretaceous *Belemnite* so far discovered in California. It is one of the most characteristic fossils of the Shasta Group, and besides the localities mentioned in the report of the Survey, Vol. 1, it has been found at various places on the east side of the Northern Coast Range, more especially in Colusa County, and elsewhere east of Clear Lake.

* For reasons which will be detailed in their proper place, I consider the group, for which I here propose this name, to be the equivalent, or at least the nearest representative, of the Neocomien. It has been heretofore included, for want of positive grounds of separation, as a provisional member of the "Division A," of the California Cretaceous. I shall, further, in this paper, use the term Martinez Group, for the upper portion of "Division A" of the California Reports; the Chico Group, for those beds of which Chico Creek, Pence's Ranch, and Tuscan Springs are typical localities; and shall call "Division B" the Tejon Group, these localities being the points where the respective formations are most strongly developed.

AMMONITES, Brug.

A. BREWERII, Gabb.

Pl. 20, Fig. 5; Pl. 19, Fig. 5 a, b, 6, 6 a.

(*Ammonites Brewerii*, Gabb; Pal. Cal., Vol. 1, p. 62, pl. 10, fig. 7.)

(*A. Newberryanus*, Gabb; (pars) *loc. cit.*, Pl. 10, fig. 6.)

This shell was originally described from several imperfect casts in sandstone, showing nothing but the surface characters, and not all of those in a perfectly satisfactory manner. Subsequent research has placed me in possession of abundant material for redescribing the species.

Shell discoidal, compressed; whorls increasing in size with moderate rapidity, each whorl embracing about one-half of the preceding one; sides flattened, converging convexly towards the dorsum, which is narrowly rounded; umbilical margin of the whorl abruptly truncated at nearly a right angle. Mouth semi-elliptical, the dorso-ventral diameter twice the transverse, the ventral emargination, produced by the encroachment of the preceding volution, being about one-fifth of the greater diameter. Umbilicus nearly one-fourth the diameter of the shell. Surface variable from nearly smooth, or marked only by sinuous striæ, to strongly costate, the striæ assuming the character of irregular ribs, most marked near, and on the dorsum.

Septum: Dorsal lobe small, bifurcate a little below the middle, and bearing two points in the notch; each branch carrying two spurs on the outer side; above the bifurcation are a large and a small spur on the main lobe. Dorsal saddle broad, divided into two unequal parts, the lower of which is much more deeply subdivided than the upper. Superior lateral lobe longer than the dorsal, trifurcate, the lateral branch on the upper side arising somewhat higher than the corresponding one on the other side, and being much more subdivided; above the origin of these

branches are two spurs on each side; these, as throughout the whole septum, are more complex on the dorsal than on the ventral side of the lobe. Lateral saddle similar to the dorsal, but smaller. Inferior lateral lobe about as long as the dorsal, resembling in shape the superior lateral, but not half so complex; the inferior lateral branch having diminished to a mere spur. Below this, to the umbilical angle, are three lobes and three saddles, presenting the fundamental characters of the laterals, but rapidly simplifying.

This description of the septum would apply very nearly to that of *A. Hoffmannii*, but in that species the lobes are broader, more symmetrical on the upper and lower sides, the saddles are proportionally larger, and the diminution in size and complexity of the lobes from the superior lateral is more marked and rapid.

The illustration given in Pal. Cal., Vol. 1, pl. 10, fig. 6, is of a young specimen from Cottonwood Creek, Shasta County.

Locality: Shasta Group, Cottonwood Creek.

A. TRASKII, Gabb.

Pl. 19, Fig. 7, *a*, *b*.

(*A. Traskii*, Gabb; Pal. Cal., Vol. 1, p. 63, pl. 11, fig. 10; pl. 12, fig. 11.)

Young specimens of this shell have so many points of difference from the adult that they might be mistaken for a different species. The adult has a mouth nearly as broad as long, the sides of the whorl being strongly arched. A specimen a little over two inches in diameter, shows a section nearly identical with that of *A. Hoffmannii*, Pl. 11, fig. 13 *a*, while a still smaller one before me, 1.3 inch in diameter, is as flat on the sides as *A. Brewerii*; and the ribs, which are strongly sinuous on the sides, become obsolete at the dorso-lateral margin, the dorsum being very much flattened and smooth.

This species is not rare at Cottonwood Creek, Shasta Group.

A. HOFFMANNII, Gabb.

Pl. 20, Fig. 8, *a*.

(*A. Hoffmannii*, Gabb; Pal. Cal., Vol. 1, p. 65, pl. 11, 12, fig. 13, *a*, *b*, *c*.)

A variety of this shell was collected by Mr. Mathewson at Cottonwood Creek, in which the whorls are much thicker than in the form described; the aperture

being exactly as wide transversely, as from the dorsum to the umbilical margin. The periodical constrictions on the cast figured, are about as numerous on these specimens as on the flatter forms, the thickening of the shell at those points showing itself as a faint rib on the outside; a specimen before me has eight on one volution. The other ribs, mentioned in the description and shown in the figure quoted above, are entirely absent in some cases. No differences exist in the septum.

A. BATESII, Trask.

Pl. 20, Fig. 9, *a*; Pl. 21, Fig. 10, *a*, *b*.

(*A. Batesii*, Trask; Proc. Cal. Acad., 1855, p. 40.)

(*Id.*, Gabb; Pal. Cal., Vol. 1, p. 67, pl. 13, fig. 16, 16 *a*, *b*.)

The largest known, most widely diffused, and one of the most variable Ammonites of California.

The form described by Dr. Trask, and used by me as the typical form of the species, is many whorled, the volutions nearly circular in section, increasing very slowly in size, and barely more than in contact. In this form the surface is usually ornamented by simple, linear ribs, with fine revolving lines in the interspaces. Another variety was mentioned, in which the whorls increase much more rapidly in size, several specimens having been found of over a foot in diameter. A third variety has since been obtained, in which, in the young state, up to an inch, or an inch and a half in diameter, the whorls are broader than high, the dorsum broadly rounded, and the umbilicus occupies more than half the diameter of the shell, is funnel-shaped, very deep, and is bordered by a sharp angle, the surface between this angle and the suture being flat. As the shell in this variety grows older the angle disappears, the flattening gradually rounds out, and the older shell assumes the normal form of the species, except that it bears an occasional well-marked, rounded, slightly sinuous rib; the linear ribs are found in the very young shell, but have not been detected in the older forms of this variety. In all of these varieties the septum, which is very characteristic of the species, continues the same. The figure of the septum given in the first volume, is from a weathered specimen, and has lost all of its more minute details. Besides the parts figured and described, the ventral lobe seems to be very large, and projects a spur beyond the suture, the points reaching to and intruding between the tips of the lower branch of the inferior lateral.

A. TEHAMAENSIS, Gabb.

(*A. subtricarinatus*, Gabb (not d'Orb.); Pal. Cal., Vol. 1, p. 60, pl. 10, fig. 4.)

Further study of this shell leads me to believe that it is distinct from *subtricarinatus*. It differs from that species in having three distinct, acute dorsal keels;

d'Orbigny's shell possessing but one in the middle, the undulated dorsal ends of the lateral ribs making the other two. The Californian species bears a series of ribs on the sides, all larger in proportion than in the French shell, and entire, while in the other they are alternately bifurcate; that is to say, the ribs are alternately an entire one, reaching from the umbilical to the dorsal margin, and a Y shaped rib dividing on the middle of the shell, and sending two branches to the dorsum. In size, and in proportionate size of volutions, the two shells are closely allied, as well as in general style of ornament; and so far as we yet know, the geological horizon of the Californian is very near that of the European species. The absolute age of the Cretaceous strata of the northern part of the State has not yet been fully determined; but, as will be explained in the proper place, it seems not improbable that representatives of both the Gault and Lower Green Sand will be found included in what has here been provisionally termed the Shasta Group. It is apparently from this member that the present species is derived.

A. SUCIAENSIS, Meek.

Pl. 21, Fig. 11, *a*, *b*.

(*A. complexus* var. *Suciaensis*, Meek; Proc. Phil. Acad., 1861, p. 317.)

A very characteristic, but not very perfect specimen of this species was found near Monte Diablo. Mr. Meek, to whom I sent sketches, says that he considers it identical with the Sucia Island form; differing in some of the details of the septum, but not sufficiently to indicate a specific difference.

A. JUGALIS, n. s.

Pl. 22, Fig. 12, *a*, *b*, 13 *a*.

SHELL small, rounded discoidal, whorls rapidly increasing in size and deeply embracing; body whorl sub-appressed on the sides or, in some cases, regularly arched, dorsum rounded; umbilicus small, deep, margin rounded, or sub-angulated. Surface polished, or marked only by a few faint, sinuous lines, arching forwards, and more distinct on the dorsum; besides these there is a variable number of thickened ribs in the substance of the shell, starting from the umbilical margin, and curving outwards and forwards sinuously, and crossing the dorsum, where they are most strongly marked; these ribs, from three to six in number on a single volution, are more prominent on the internal than on

the external face of the shell, and leave corresponding grooves on the cast.

Septum composed of a dorsal, superior and inferior lateral, and four supplementary lobes. Dorsal lobe long, bifurcate for two-fifths of its length, with two small points over the siphuncle; the branches bearing two spurs on the outer side; above the branches are one large and two smaller spurs. Dorsal saddle deeply divided into three irregular branches. Superior lateral lobe pretty symmetrically trifurcate; the upper lateral branch being a little more complex than the lower; two spurs above on each side. Lateral saddle like the dorsal, but a little smaller. Inferior lateral lobe much smaller than the superior, slender, unsymmetrical, obliquely bifurcate near its end, and bearing a large branch on the upper side near the middle. Supplementary saddles bifurcate; supplementary lobes rapidly diminishing in size to the umbilical angle, and resembling in fundamental structure, the inferior lateral.

Diameters: greater, 1.6 inch; lesser, 1.25 inch; diameter of umbilicus, .2 inch; height of aperture from umbilical angle, .9 inch; width, .65 inch. A specimen from Benicia gives for the greater diameter, 2. inch; lesser, 1.5 inch; umbilicus, .28 inch; height of aperture as above, 1. inch; width, 1. inch.

This shell, though one of the most inconspicuous, is nevertheless one of the most interesting of the California Ammonites, being the only member of the family known to occur at the same time in the Martinez and Tejon Groups. It is found at Martinez and Benicia in the former group, and I have collected it in the latter, in place, at the very top of the series at the coal-mines near Clayton. Plate 10, figs. 5, and 6 *b*, Cal. Report, Pal., Vol. 1, are from a specimen from above the coal-beds on Coal Mine Hill, near Mount Diablo.

A. WHITNEYI, n. s.

Pl. 22, Fig. 14, *a*, *b*.

SHELL discoidal, whorls about six, rounded, slightly embracing, increasing gradually in size; sides rounded, slightly converging towards the dorsum, which is regularly arched; umbilical margin abruptly rounded; umbilicus broad, shallow. Aperture sub-

ovate, considerably wider towards the ventral margin than near the dorsal, but slightly emarginated by the encroachment of the preceding volution. Surface marked by simple, straight, rounded ribs, arising on the umbilical margin, and continuing over the dorsum.

Septum composed of a dorsal, a superior and an inferior lateral, and two supplementary lobes to the umbilical margin. Dorsal lobe divided for half its length, deeply notched over the siphuncle, each branch tridentate on the end, carrying one compound and two simple spurs on the outer side; body of the lobe bearing two large spurs and one smaller one above. Dorsal saddle broad and divided into two compound bifurcate branches. Superior lateral lobe as long as the dorsal, narrow and bifurcate in the middle, each branch being trifurcate on the end, and carrying one large spur above on the outer side; body of the lobe with two or three smaller spurs above. Lateral saddle like the dorsal, but a little more simple. Inferior lateral lobe shorter than the superior, divided a little below the middle into one complex branch on the ventral side, and two more simple ones towards the dorsal; above this division is a large transverse spur on each side. Inferior lateral saddle small and deeply bifurcate. First supplementary lobe small, bifurcate, the lower branch tridentate; the remaining lobe consists of but three small spurs.

From the Shasta Group, Cottonwood Creek, Shasta County.

Diameter, 4.25 inch; diameter of umbilicus, 1.6 inch; height of aperture from top of inclosed volution, 1.8 inch; greatest width, 1.8 inch.

A. STOLICZKANUS, n. s.

Pl. 23, Fig. 16, *a*.

SHELL thick, robust, heavily costate; whorls five or six, increasing rapidly in size, enveloping nearly one-half of the preceding volution; sides arched, most prominent in the middle, or a little nearer the umbilical than the dorsal margin; back broadly rounded, nearly flat; umbilicus large and deep, the umbilical

face of the volutions nearly straight, the margin rounded. Surface ornamented by large ribs arising on the margin of the umbilicus, and crossing the dorsum transversely; these ribs all show a tendency to tuberculation, though alternate ones only carry the tubercles well developed; these are arranged as follows: one small one on the umbilical angle, a larger one, slightly flattened in the direction of the rib, and placed on the middle of the side of the whorl; and a very large one, strongly flattened in the same manner, and placed on the dorsal face between the median line and the dorso-lateral margin; the arrangement of the last pair of tubercles is such that the dorsal face of the shell appears to carry a deep and broad median groove. The alternating, intermediate ribs in some cases are tuberculate, and reach the margin of the umbilicus, while in others, they are nearly obsolete, and occasionally entirely wanting.

The septum seems to be composed of a dorsal and two or three lateral lobes, quite small but complex, and with large saddles.

Diameter, 3.7 inch; diameter of umbilicus, 1.4 inch; height of aperture, 1.4 inch; width, 1.8 inch.

This is one of the most strongly characterized species of the California Cretaceous, having no near allies in shape or ornamentation in the State, so far as known. It belongs to the same group as *A. tuberculatus*, Sby., *A. Michelinianus*, d'Orb., and *A. Archiacianus*, d'Orb., three species characteristic of the Gault of Europe. The first of these has a deep, narrow groove on the dorsum, and large tubercles, but no transverse ribs; the second is characterized by similar tubercles, but in the place of single ribs proceeding from the umbilicus across the dorsum, the ribs bifurcate on the umbilical margin, and on the dorsal face the tubercles are connected by a series of oblique ribs, presenting a zigzag appearance. The nearer ally is *A. Archiacianus*; but while this resembles it in both the transverse section and in the general arrangement of the tubercles, it has no ribs on either the sides or back, the spaces between the series of tubercles being, in a measure, channelled.

I take pleasure in dedicating it to my friend Dr. Ferd. Stoliczka, Palæontologist of the Geological Survey of India, in recognition of his able and valuable labors among the Cretaceous fossils of that country.

From the Shasta Group, Cottonwood Creek, Shasta County. A single specimen obtained by Mr. Mathewson.

A. FRATERNUS, n. s.

Pl. 23, Fig. 15, *a*, *b*.

SHELL small, whorls rounded, deeply enveloping; sides rounded and converging towards the dorsum, which is regularly convex; umbilicus deep, moderate in size; umbilical margin rounded. Surface marked by slightly sinuous ribs, nearly straight, arising on the umbilical margin, and continuing over the dorsum; every fourth or fifth of these ribs is a little larger than the others, and bears a prominent flattened tubercle on the border of the umbilicus. An occasional constriction exists between the ribs.

Septum composed of a broad dorsal, a large superior lateral, a very small inferior lateral, and two supplementary lobes. Dorsal divided for about a third of its length, carrying two large serrate teeth over the siphuncle, each branch with a large, and two smaller spurs on the outer side; body of the lobe with three large spurs above the division. Dorsal saddle bifurcate, each branch subdivided. Superior lateral lobe trifurcate, the branches nearly equal and trifid at the extremities; a large and a small spur above the fork. Lateral saddle nearly as wide as the dorsal. Inferior lateral lobe not more than half as long as the superior, trifid on the end, with two small spurs on the upper side and one on the lower. Supplementary lobes very small and trifid.

Diameter, 1.4 inch; diameter of umbilicus, .45 inch; height of aperture, .55 inch; width, .6 inch.

A single specimen, nearly a miniature of *A. Traskii*, in general appearance, but with almost identically the septum of *A. Hoffmannii*, differing only from that of the latter species in some of the details. It cannot be the young of either of these species however, because though its surface resembles *Traskii* the septum is radically different; while all of its external details, the form and ornamentation, are entirely unlike any of the very large number of *Hoffmannii* that I have examined. No specimen of that species that I have ever seen shows the slightest trace of tuberculation, and in none are the ribs so marked. The single constriction on the surface of the specimen before me, is not due to a thickening of the shell-substance, but is as strongly marked on the outside of the shell itself as on the cast. Another point, though of less importance than the above, is that this

shell is from the Martinez Group, while both of the other species are peculiar to the Shasta Group.

Locality: Martinez Group, Benicia; found by my lamented friend, Mr. Rémond.

TURRILITES, Lam.

T. OREGONENSIS, Gabb.

(*T. sp. indet.*, Gabb; Pal. Cal., Vol. 1, p. 73, pl. 20, fig. 201.)

At the above place I indicated the existence of the first known species of the genus on the West Coast, but did not feel warranted in naming it from so small a fragment. I have since seen several fragmentary specimens from Oregon, the finest of which is from the Cretaceous deposit on the Crooked Creek of the Des Chutes, the existence of which was made known by the Geological Survey in 1864. The shell is very constant in its sculpture, the spire elevated, and the whorls increase slowly in size. The longest spiral I have seen is between two and three inches in length.

ANCYLOCERAS, d'Orb.

A. RÉMONDI, Gabb.

Pl. 23, Fig. 17.

(*Crioceras (Ancyloceras?) Rémondi*, Gabb; Pal. Cal., Vol. 1, p. 75, pl. 14, fig. 24, 24a.)
(*Ancyloceras sp.?*, Gabb; *loc. cit.*, p. 78, pl. 15, fig. 30.)

An examination of the septum of an undoubted fragment of the spiral part of this species, proves beyond question that the opinions I expressed in regard to the straight portion were correct. The species will therefore have to stand under the above name.

A. PERCOSTATUS, Gabb.

Pl. 24, Fig. 19.

(*Crioceras percostatus*, Gabb; Pal. Cal., Vol. 1, p. 77, pl. 16, 17, fig. 26.)

This magnificent species was described from fragments, and in the specimen figured, the outer portion fitted so neatly over the inner volution, that I was misled into believing that they were parts of a continuous spiral. Additional material

has thrown light on the subject, and proves that the closely costate portions figured on Pl. 16, belong together as the spiral, succeeded by a long subquadrate arm without ribs, the "outer whorl" with the large ribs being a part of the recurved portion of a true *Ancyloceras*. The species is enormous, but variable in size. The specimen figured was about thirty inches in length, while one very perfect specimen in the cabinet of Mr. Voy, now deposited in the museum of the College of California, is but seventeen inches long.

? *A. LINEATUS*, n. s.

Pl. 23, Fig. 18, *a*, *b*, *c*.

This species is only known by two fragments of the straight limb. The section is ovate, a little narrower on the ventral than on the dorsal side; surface marked by numerous, very slightly oblique linear ribs, with broad concave interspaces; each rib bears on its dorso-lateral face a minute tubercle.

Septum composed of a dorsal and ventral lobe, and two laterals on each side, giving three saddles on each side. Dorsal lobe divided a little below the middle, with two teeth over the siphuncle, each branch bearing two spurs on the outer side, one large spur and one very small one on the body of the lobe. Dorsal saddle broad, deeply divided into two bifurcate parts. Superior lateral lobe broad, as long as the dorsal, bifurcate in the middle, each branch again bifurcate, and with a large spur on its outer side above the subdivision; the body of the lobe bears a single large spur above the fork. Lateral saddle like the dorsal. Inferior lateral lobe like the superior lateral, but a little smaller. Ventral saddle like the others, but a little smaller. Ventral lobe shorter than the others, trifurcate, the branches dentate, two small spurs above the branches.

This septum is unlike any other in California, unless it be that of ? *Hamites quadratus*, which it resembles in the number and fundamental plan of structure of the lobes. In that species the saddles are proportionately very much larger, and the lobes are more compact; the degree of complexity could be accounted for by the difference in size. The two shells differ materially in form.

Length of the largest fragment, 2.7 inch; greater diameter, .85 inch; lesser, .7 inch; distance between the ribs, .1 inch.

One specimen from the Shasta Group (?) Cottonwood Creek, another from near Folsom, from "Rock Corral," found by Mr. Gorham Blake.

HELICANCYLUS, *N. Gen.*

General form resembling *Ancyloceras*; shell commencing with a dextral, open, descending spiral, as in *Helicoceras*, the spiral afterwards opening, the shell becoming straight for a definite distance, and then recurving as in *Ancyloceras*.

The relations of this genus are obvious; it is an *Ancyloceras* in which the spiral portion, instead of forming in the same plane, descends as in *Helicoceras*.

It may be questioned, how far these aberrations, from the regular spiral form of the more typical *Ammonitidæ*, may retain a generic value. It is by no means difficult to take the leading genera *Ammonites*, *Turritiles*, *Baculites*, &c., and find trenchant characters; but it becomes more difficult to find sharp lines of division when we take all the species of the family and endeavor to place each in a well-defined genus. Successive discoveries are every year introducing new links into the chain of genera, until it seems almost impossible to imagine any new form, or any combination of characters on which new genera can be founded.

In this aberrant group of *Crioceras*, *Helicoceras*, *Ancyloceras*, *Heteroceras*, *Anisoceras*, *Toxoceras*, and *Helicancylus*, it seems inevitable that the addition of any other form must almost unavoidably result in the destruction, or coalescing of some of the at present received genera.

The present genus is founded on a single species, of which I am so fortunate as to possess an almost entire series of fragments of all the parts. Although allied to Pictet's *Anisoceras*, it differs in the young shell being a *regular* descending spiral, and not sinuous. That author figures, in his "Traité de Paléontologie," a very crooked fragment, such as could by no possibility belong to the present shell, any more than it could be a part of a *Helicoceras* or a *Turritile*.

The figures of various species of *Anisoceras*, in Pal. Suisse, show a style of ornament very similar to the present one.

In his description, M. Pictet says: "Il paraît caractérisé par une forme plus irrégulière que chez aucune autre céphalopode. La coquille dans le jeune âge est sinueuse, formant une spirale *irrégulière* héliciforme, à tours disjoints, ayant tous une double courbure, et ne pouvant pas être compris dans un plan. Plus tard elle se redresse et s'infléchit en crosse comme les *Ancyloceras*." It will be seen that the above definition cannot apply to the present genus.

The same author anticipated the occurrence of this genus, as will be seen by consulting the analytical table of the group in Part 3, *Paleontologie Suisse*. He defines the three allied genera thus:

“Une spire composée de tours disjoints, et une crosse. *Ancyloceras*.”

“Portion spirale très courte et irrégulière, a tours très-écartés, une très-grande crosse comprise dans une plan. *Anisoceras*.”

“Spire régulière d'*Helicoceras* terminée par une crosse. *Cas possible non encore observé*.”

There is one character, to which attention has been called, both by this author and by Dr. Stoliczka, in *Palæontologia Indica*, which, if found to be constant in *Anisoceras*, will serve as a good means of distinguishing the two genera; I fear, however, that a generalization on this point may yet be premature. I refer to the style of the septum. Pictet defines his genus as possessing six lobes and six saddles, the two laterals being bifurcated and nearly equal. Stoliczka more properly reduces the number to five, and speaks of the ventral as being rather a lobule than a distinct ventral lobe, on account of its small size and simple ornament in all the species yet examined. The present species has six lobes, the ventral being normally large, and the lateral being deeply trifurcate, the inferior lateral not more than half the length of the superior; thus resembling much more the style of *Ancyloceras* than *Anisoceras*.

Among the species referred to *Anisoceras*, and yet but imperfectly known, there are some that seem open to the suspicion of belonging in the present group. The most marked case is perhaps *Hamites tenuisulcatus*, Forbes, *Ancyloceras id.*, d'Orb., *Anisoceras id.*, Stol. The figure of the spiral portion in *Pal. Ind.*, Vol. 3, pl. 85, fig. 14, certainly looks like our genus, and there seems to be nothing incompatible with this view, in the figure by Forbes in the *Geol. Transactions*. Its septum is as yet unknown.

H. *ÆQUICOSTATUS*, Gabb.

Pl. 25, Fig. 20 *a—g*.

(*Ptychoceras æquicostatus*, Gabb; *Pal. Cal.*, Vol. 1, p. 74, pl. 13, fig. 20.)

SHELL rather small; spiral portion with the spire low, the height being about equal to twice the thickness of the outer volution; whorls increasing very gradually in size, nearly in contact; number of whorls unknown, but from the rate of increase in diameter, about four or five (one and a half preserved); the straight limb was apparently about twice as long as the diameter of the spiral; the larger terminal limb seems to

have increased more rapidly in diameter than the others, is not perfectly straight, but bends a little outwards, giving a convex line longitudinally on its ventral face. Surface of the spiral portion ornamented by oblique, nodulated ribs; these are small, linear, and arched forwards on the ventral face, large on the sides and dorsum, and more advanced on the lower than upper side, being oblique on the dorsum; they carry three pairs of nodes, one on each side of the median dorsal line, one on each dorso-lateral margin, and one on the middle of each side. The straight limb retains these ribs, which here lose their obliquity, but retain all the other characters; in addition, on this part of the shell, between each pair of these ribs, is placed a smaller, simple rib. On the return limb, the ribs lose all their tubercles, become even in size, acute, and with concave interspaces; the section of this portion of the shell is rounded subquadrate, a little narrower on the dorsal than on the ventral side.

Septum composed of a dorsal and ventral lobe, and two laterals on each side. Dorsal lobe broad, divided for half its length, each branch carrying three equal spurs on the outer side; above this, on the body of the lobe, are one large and three smaller spurs. Dorsal saddle divided into two bifurcate branches. Superior lateral lobe longer than the dorsal, broad, and carrying three slender, nearly equal branches; the middle one trifid on the end, the upper lateral much more complex than the lower; above these, on the body of the lobe, are two or three spurs, diminishing regularly upwards. Lateral saddle like the dorsal, but a little smaller, and obliquely divided. Inferior lateral lobe not more than half as long as the superior, slender and equally trifurcate. Ventral saddle like the others, but smaller. Ventral lobe nearly as long as the dorsal, slender, trifurcate, each branch trifid, the laterals bearing two spurs above on the outer side; the body of the lobe carries two spurs above the origin of the branches.

Total length, 6 inches; diameter of spiral, 2 inches; diameter of volution at termination of spiral, .6 inch; height of apex, .9 inch; length of longest fragment of first straight limb, 4. inches; length of longest fragment of return limb, 2.7

inches; greater diameter of aperture of same, 1.3 inch; lesser diameter, 1.15 inch. It is very probable that these fragments do not all belong to the same individual. The specimen figured in Vol. 1, Pal. Cal., seems to be more nearly in proportion to the spiral herein described. That fragment shows the recurve, and on one or two of the ribs of the thinnest part, can be seen tubercles corresponding in character to those described above.

DIPTYCHOCERAS, *N. Gen.*

Three straight limbs in contact, partly enveloping.

This genus bears the same relation to *Ptychoceras* that *Hamites* does to *Hamulina*. It is a *Ptychoceras* in every respect, except that it has an additional limb which incurves, enveloping both the preceding to a slight degree only.

Stoliczka and d'Orbigny both notice the occurrence of species of *Ptychoceras* with more than two limbs, and the former author amends the definition of the genus so as to cover the case. His description is as follows: "Elongated, lanceolate, straight, once, twice (or many times?) reflected; the siphuncle dorsal, the sutures divided into six lobes and six saddles, all of which (excepting the ventral lobe?) are bipartite." With all deference to so high an authority as Dr. Stoliczka, I am not prepared to accept this definition of *Ptychoceras*, unless, at the same time, we modify the characters of several other genera of the family. If the number of straight limbs is not of generic value, then why not include *Baculites* also? In the present state of our knowledge, it seems that there is a well-defined group of species characterized by two straight, parallel limbs, the larger, or newer of which never develops beyond a certain point on the length of the smaller; while another group, including *P. Dupinianum*, d'Orb., *P. Forbesianum*, Stol., and the following species, has this larger limb continued and again reflected. Should it be ascertained that there is a gradation between these two, or that other species have more than two reflections, then there will be good grounds for doubting the validity of my genus; until then, I believe we have sufficient reasons for maintaining it.

Solenoceras, Conrad, founded on a single specimen of *Hamites annulifer*, Morton, is a shell that had at least two straight limbs, one partially enveloping the other; the greater of these has at its large end, a little offset or deflection, apparently indicating an abrupt bending backwards, or outwards, of the shell, and not an incurving, as in the present form. Whether this was the case, what was the entire form of *Solenoceras*, or whether it can be at all separated from *Ptychoceras*, are as yet unknown. All the information we possess on the subject is obtained from a unique specimen, which shows no peculiar generic characters, and which was, in plain truth, separated from *Ptychoceras* only on suspicion.

D. LÆVIS, n. s.

Pl. 25, Fig. 21, *a*, *b*.

SHELL moderate in size, limbs long and slender, section of the smaller limb sub-elliptical, slightly flattened on the ventral side; second limb subcircular, very slightly emarginate by the encroachment of the preceding branch; last limb suddenly incurved, and extending to (or beyond?) the middle of the shell. Surface plain, polished, and ornamented only by a few extremely faint undulations; the outer or final limb, which is in places very much broken, had one or more constrictions or internal ribs, which do not seem to have been visible on the external surface; one or two such internal ribs seem to have existed, though in a much less degree, on the middle limb. Septum composed of a dorsal, a ventral, superior lateral, and two supplementary lateral lobes; dorsal lobe deeply divided into two curved branches, each branch bearing one very large spur on the outer side; the body of the lobe with one lateral spur above on each side. Dorsal saddle broad, divided into two branches, that on the upper side being again divided. Superior lateral lobe shorter than the dorsal, more robust, and resembling it in pattern. Lateral saddle like the dorsal, but smaller, and both branches simple. First supplementary lobe very oblique, small and trifurcate. Second straight and simple. Ventral lobe longer than the dorsal, slender, trifurcate, the middle branch toothed, the laterals trifid; above these branches, one large spur on each side.

Length of specimen (less a little of the smaller end), 2.65 inch; total length, 3. inch?; length of small limb retained in the specimen, 1.4 inch (= 1.75 inch total?); length of larger limb, 1.6 inch; (aperture partly destroyed); approximate diameter of aperture, .45 inch; diameter in middle of middle limb, .35 inch; diameter in middle of small limb, .12 inch.

From the Shasta Group, Cottonwood Creek, Shasta County. Not rare; discovered by Mr. Mathewson.

The present species seems very closely allied to *Pty. Forbesianum*, Stol.; Pal. Ind., Vol. 3, p. 196, pl. 90, fig. 11, but is twice the size of that shell, and differs in the

presence of the faint undulated ribs on the larger limbs, and in the presence of the well-marked internal ribs. Unfortunately no septum was detected in the Indian species, and we cannot be absolutely certain of their specific difference, since the characters on which the two forms are separated, are among those which are most subject to variation.

BACULITES, Lam.

B. OCCIDENTALIS, Meek.

(*B. ovatus*? Meek (not Say), Trans. Albany Inst., Vol. 4, p. 48.)

(*B. occidentalis*, Meek; *loc. cit.*, p. 49.)

(*B. sp. indet.*, Gabb; Pal. Cal., Vol. 1, p. 81, pl. 17, fig. 28, 28 a; pl. 14, fig. 28 b.)

As yet, only known from Vancouver Island, whence Mr. Meek obtained specimens, which he referred doubtfully to Say's species, pointing out some differences and suggesting the above name, should these differences prove constant. More recently in his enumeration of the Cretaceous fossils, in the Proceedings of the Philadelphia Academy, and in the Smithsonian Check List, he has elevated the form to the rank of a distinct species, in which I follow him.

GASTEROPODA.

FUSUS, Lam.

F. TUMIDUS, n. s.

Pl. 26, Fig. 22.

SHELL elongated fusiform, thick; spire elevated, whorls six or seven, sides swollen, outline sinuous; body whorl concavely sloping above, tumid in the middle, narrowed in advance. Aperture broad above, narrow below, canal produced; outer lip simple (?), inner lip slightly incrustated. Surface marked by about ten short broad longitudinal ribs or undulations on the middle of the whorl, crossed by numerous revolving linear ribs.

Length, 1.15 inch +; width, .6 inch. The total length of a perfect specimen would probably be about 1.4 inch.

Very rare. A single specimen from the Martinez Group, at Martinez; Coll. by Mr. Mathewson.

This shell is allied to *F. Martinez*, but differs in the more narrowly tumid character of the whorls, and the fewer longitudinal ribs. *F. Martinez*, so far as known, is characteristic of the Tejon Group.

F. OCCIDENTALIS, n. s.

Pl. 26, Fig. 23.

SHELL small, robustly fusiform; spire moderately elevated, turriculated; whorls five, angulated, sloping straight above, body whorl slightly convex below. Aperture broad, angulated posteriorly, produced in a narrow canal in front; outer lip simple, inner lip incrustated. Surface marked by about thirteen or fourteen small nodes on the angle of the whorls, and by numerous revolving ribs, about six or seven above the angle, and from sixteen to twenty below, two or three of which are larger than the others.

Length of broken specimen, .6 inch; total length, about .7 inch; width of body whorl, .45 inch; width of aperture, .2 inch. With the preceding.

NEPTUNEA, Bolt.

S. G. *Tritonofusus*, Beck.

(*Atractus*, Ag. *preoc.*)

N. (T.) CRETACEA, n. s.

Pl. 26, Fig. 24.

SHELL thin, short, rounded fusiform; spire low, whorls five, rounded. Aperture broad, angulated behind, produced into a curved canal anteriorly; outer lip simple, thin, columella curved, excavated in the middle. Surface smooth, or if sculptured, carrying only very minute markings.

Length, 1.7 inch ; width, 1. inch ; length of aperture, 1.2 inch.

The only specimen I have seen is from Martinez, from the Tejon Group, or from the beds intermediate between that and the Martinez Group, west of the town. It is so weathered that the sculpture, if any, is obliterated. The only shell with which this could be confounded, even in casts, is *Fasciolaria læviuscula*, and from that it can be readily distinguished by its more gibbous form and curved canal.

N. MUCRONATA, n. s.

Pl. 26, Fig. 25.

SHELL moderate in size, thin, rounded fusiform ; spire elevated, acute ; whorls seven, rounded ; suture sharply defined, linear ; body whorl regularly convex, swollen in the middle, excavated in advance. Aperture large, acute behind, continued into a (slightly curved?) canal in advance ; outer lip simple, thin ; inner lip slightly incrusted ; canal (from lines of growth) moderately produced and a little deflected. Surface marked by a few faint striæ of growth, and by regular, small, revolving impressed lines.

Length, 1.1 inch ; width of body whorl, .6 inch ; length of aperture, .65 inch. Not common in the Martinez Group, at Martinez ; Mathewson. The shell resembles somewhat *Fusus Californicus*, but can be distinguished by its more slender acuminate spire, the entire absence of longitudinal ornament, thinner shell, more convex form, the curved canal, and by the details of sculpture. *F. Californicus* has not, as yet, been found at so low a horizon, stratigraphically, as the present species.

PALÆATRACTUS, *N. Gen.*

I propose this name for a group of *Fusoids* of more or less pyriform shape, with a low spire, thick shell, slightly twisted columella, simple outer lip, inner lip incrusted, and with a heavily ribbed or cancellate surface. They cannot with propriety be placed in any of the heretofore described genera of *Fusinæ* ; *Neptunea* has a more or less elevated spire, and its sub-genus, *Tritonofusus*, with a low spire, is very thin, and the surface smooth, or marked only by fine lines ; *Cantharus* has the outer lip crenu-

lated or striate internally; *Tritonidea* has a tooth on the posterior part of the columellar lip, and the other genera are obviously untenable.

P. CRASSUS, n. s.

Pl. 26, Fig. 26.

SHELL small, pyriform, heavy; spire low, whorls five, rounded; suture impressed. Surface marked by prominent revolving ribs, crossed by irregular longitudinal ribs or lines; these latter are variable in size, number, and disposition, generally having a more or less regular arrangement, being of about the same size as the revolving ribs, and producing nodes or tubercles on the latter where they cross; between the larger markings are very numerous fine lines of growth. Aperture broad in the middle, acute behind; outer lip simple, inner lip incrusted; canal moderate and slightly twisted.

Length, .62 inch; width, .45 inch; length of aperture, .5 inch.

From the Shasta Group, from a cañon in the foot-hills, a mile south of the road from Colusa to the Sulphur Springs, near the eastern margin of the Coast Range, Colusa County. Rare.

ERIPACHYA, N. Gen.

SHELL short, robust, subovate to subfusiform, spire moderately elevated. Aperture broad, terminating in advance in a very short canal or a mere notch; outer lip simple; inner lip more or less heavily incrusted. Surface marked by longitudinal ribs and revolving lines.

The present genus is proposed to receive three species described in Pal. Cal., Vol. 1, under the name of *Neptunea*, but which possess a series of characters in common, sufficiently different from the typical species of that genus, to warrant their separation. They are small shells, about an inch in length, robust, thick, and want entirely the recurved canal of *Neptunea*; and they cannot, with any greater propriety, be placed in any of the other described genera of the family. They are

all peculiar to the older divisions of our California Cretaceous, and two out of the three species are represented by but few specimens, and are confined to single localities.

E. PONDEROSA, Gabb.

(*Neptunea ponderosa*, Gabb; Pal. Cal., Vol. 1, p. 88, pl. 18, fig. 38.)

The most common of the three species, numerous specimens having been obtained at Tuscan, or Lick Springs, by Dr. Veatch. It has also been found at Pence's Ranch, Butte County.

E. PERFORATA, Gabb.

(*Neptunea perforata*, Gabb; Pal. Cal., Vol. 1, p. 89, pl. 18, fig. 39.)

Referred by error to page 81 on the index to the plate.

Not rare at Cottonwood Creek, Shasta Group; unknown elsewhere.

A small shell, half an inch long.

E. HOFFMANNII, Gabb.

(*Neptunea Hoffmannii*, Gabb; Pal. Cal., Vol. 1, p. 90, pl. 18, fig. 41.)

Found with the preceding. Rare.

? NEPTUNEA GRACILIS, Gabb.

This shell, and ? *N. supraplicata*, were referred to *Neptunea*, because they agree with that genus, more than with any other. They however possess some characters which render this reference doubtful, and more perfect material than has yet been obtained will perhaps warrant their separation.

PERISSOLAX, Gabb.

P. BLAKEI, Con. Sp.

(*Busycon* ? *Blakei*, Con.; P. R. R. Rep., Vol. 5, p. 322, pl. 2, fig. 13.)

(*P. Blakei*, Gabb; Pal. Cal., Vol. 1, p. 92, pl. 21, fig. 110.)

A specimen before me, of this shell, from Martinez, has three distinct revolving angles on the body whorl, instead of the two on the specimen figured as above, and the spire is not so high. Mr. Conrad denies my determination of the species, saying that his *Busycon Blakei* is very different. I cannot agree with him, and am perfectly satisfied that this is the shell described by him from Tejon, where it is very abundant, and where no similar shell has ever been found. I would be less

positive were it not that he holds the same opinion about several other species, and it is not probable that a single boulder should have contained several species, never afterwards encountered by Professor Brewer on his visit, by me on the three or four occasions when I have been there, or by Dr. Horn, who collected there assiduously for a number of months!

Mr. Conrad, in the Smithsonian Check List, mentions a *P. Gabbii*, Con. No such species has ever been described; can this be the shell? Mr. C. says he does not remember, and I have no other clue.

SURCULA, H. & A. Ad.

S. PRÆATTENUATA, n. s.

Pl. 26, Fig. 27.

SHELL very long and slender; spire unusually high; whorls angulated, numerous (perhaps ten or more). Surface marked by a row of small nodes on the angle of the whorls, and by numerous small revolving ribs, crossed by irregular lines of growth, the latter, at times, elevated, so as to form imperfect longitudinal ribs. Aperture short, as compared with the height of the spire; outer lip broadly and shallowly emarginate above the angle of the whorl, produced and regularly convex below.

Length, 2.5 inch (about); length of aperture, 1 inch; length of body whorl, .7 inch.

From the Tejon Group, San Diego; Dr. Cooper.

This species can be at once distinguished by its extremely elongate form, and the comparatively short aperture. As is usually the case with very slender fossil shells, it is nearly impossible to obtain an entire specimen, and I have never been able to see the whole spire. From the rate of diminution in size of the whorls towards the apex, I believe the species to have had at least ten, and perhaps one or two more volutions.

S. (SURCULITES) SINUATA, Gabb.

Pl. 26, Fig. 28.

(*Conus sinuatus*, Gabb; Pal. Cal., Vol. 1, p. 123, pl. 29, fig. 227.)

SHELL broadly fusiform, spire shorter than the aperture, turreted; whorls about six to six and a half, angulated, concave

above, the upper volutions undulated or minutely nodose on the angle; suture channelled. Aperture moderately wide, biangular posteriorly, outer lip deeply notched above the angle, prominently rounded in the middle. Surface marked by lines of growth, and by a few faint revolving lines anteriorly.

Length, 1.9 inch; width, .9 inch; length of aperture, 1.2 inch.

From the Tejon Group, Tejon; at Cañada de las Uvas and Arroyo de los Alisos.

The species was originally described from a single broken specimen, which since proves to have been immature. It showed none of the characteristic portion of the lower part of the mouth, and while I noted the peculiar curve in the outline of the body whorl, I was misled into believing it to be a *Cone*. Having since obtained better specimens, I am fortunately able to refer it to its proper genus. It belongs to a group in the genus that has been indicated by Mr. Conrad, under the sub-generic name of *Surculites*, and which is characterized by the angulated form of the present species. Mr. Conrad's type is an Eocene fossil.

S. (SURCULITES) INCONSPICUA, n. s.

Pl. 26, Fig. 29.

SHELL small, spire high; whorls six (?), angulated, concave above and on the side; body whorl broad, rapidly tapering in advance. Surface marked by two large revolving ribs, one on the angle and one a little in advance; between these, and on the upper part of the whorl, the surface is covered with minute revolving lines; below the lower of the two ribs, the remainder of the shell is marked by small revolving ribs. Aperture broad, biangular posteriorly; outer lip notched above, produced below; inner lip slightly incrustated; canal moderate.

Length of fragment, .47 inch; total length of shell, about .55 inch; width of body whorl, .3 inch; length of aperture, .25—.28? inch.

From the Martinez Group, Martinez. Rare; Mathewson.

HETEROTERMA, N. Gen.

SHELL short, robust-fusiform, spire low, body whorl dilated, canal moderately long, straight; outer lip broadly notched or emarginate near the suture; columellar lip incrustated.

The general form, and the notch at the upper part of the outer lip, place this genus, without question, in the *Pleurotomidæ*, but its thick shell, low spire, and very broad body volution, separate it unmistakably from all the known genera of the family.

H. TROCHOIDEA, n. s.

Pl. 26, Fig. 30, 30 a.

SHELL depressed fusiform, spire low, whorls five and a half, concave above, body whorl bicarinate, each carina bearing a row of large rounded tubercles; suture linear, undulated, the upper margin of each whorl being attached to the upper row of tubercles on the preceding volution; between the two carinæ on the body whorl, the surface is obliquely concave; anteriorly it is deeply excavated and produced in a long straight canal. Aperture broad above, narrow and straight below; outer lip simple, broadly emarginate on the upper surface, inner lip incrustated. Surface ornamented, besides the tubercles, by minute revolving lines, smaller above than below, and showing a tendency in advance, to alternation in size.

Length, restored from lines of growth, .9 inch; width of body volution, .6 inch; length of aperture, .65 inch.

Rare in the Martinez Group, Martinez; Mathewson.

BELA, Leach.

B. CLATHRATA, n. s.

Pl. 26, Fig. 31.

SHELL small, subfusiform; spire elevated, whorls six, the first $1\frac{1}{2}$ —2 nuclear, rounded, smooth; the others angular, flat, or slightly concave on the sides, and sloping above a little concave to plane; body whorl excavated below, bicarinate in the middle. Aperture moderately broad, tapering slightly in advance; outer lip simple, broadly excavated above, and slightly prominent in the middle; inner lip slightly incrustated. Surface marked by two

revolving angles, between which, and above to the suture, are very minute revolving striæ; in advance of the lower angle, these striæ are larger and alternate in size; besides these the whole surface is covered with longitudinal raised lines corresponding to the striæ of growth.

Length, .37 inch; width of body whorl, .18 inch; length of aperture, .2 inch.
A single specimen from the Tejon Group, Martinez; Mathewson.

CORDIERA, Rouault.

C. MITRÆFORMIS, n. s.

Pl. 26, Fig. 32.

SHELL elongate, mitræform, spire comparatively low; number of whorls unknown; body whorl concave, angulated and undulated above, long, slender, and sinuous below. Aperture long and narrow, biangular posteriorly, narrowing gradually in advance; outer lip thin, obliquely emarginate between the angle and the suture, very slightly sinuous, nearly straight below; inner lip rather heavily incrustated, and bearing two (possibly three) oblique folds near the middle; canal produced, straight; suture impressed, linear, slightly irregular. Surface bearing ten or eleven prominent, slightly oblique longitudinal ribs, starting from the angle of the whorl, and becoming obsolete before reaching the middle; crossing these are numerous revolving ribs, small above the angle and large and rounded below.

Length (less the greater part of the spire), .9 inch; length of aperture, .65 inch; width of body whorl, .4 inch.

This beautiful little shell has no near relatives in form, either in the genus, or among its associates in the formation, in other genera. Its discovery is of especial interest, since it is only the second known Cretaceous species of the genus, the other being also Californian; and this being by far the oldest species yet discovered. The existence of its congener in the Tejon Group was one of the numerous arguments used by an eminent authority, in support of his view of the Tertiary age of that formation; while we now have the genus carried back to near, if not to the

very base of the Cretaceous. So much for *à priori* reasoning, based on negative grounds.

From the Shasta Group, Colusa County, near the Hot Sulphur Springs.

TRITONIUM, Link.

T. CALIFORNICUM, n. s.

Pl. 26, Fig. 33.

SHELL small, thin; spire elevated, whorls seven and a half, the first three and a half minute, nuclear, rounded and smooth; the others rounded and costate; suture impressed, varices about two to a revolution, prominent. Aperture wide in the middle, acute posteriorly, and narrowed and produced into a short canal anteriorly; outer lip acute on the margin, bearing a thickened, rounded varix behind; inner lip slightly incrustated; canal abruptly deflected, moderate in length. Surface ornamented by about twenty acute longitudinal ribs, and about a dozen revolving ribs; between each pair of the latter are two or three fine elevated striæ; where the first four of the larger revolving lines cross the longitudinal ribs, at each point of intersection, is a minute tubercle.

Length, .7 inch; length of aperture, .45 inch; width of body whorl, 4 inch.

Rare in the Tejon Group, Tejon. Dr. Horn.

S. Gen. TRACHYTRITON, Meek.

T. (T.) TEJONENSIS, n. s.

Pl. 26, Fig. 34.

SHELL large, fusiform, thin, spire elevated; whorls four and a half or five, subangulated, nodose. Aperture broad, anterior end?; outer lip (? dentate or) plicate within, inner lip straight anteriorly; body whorl flattened and sloping above, bearing about ten flattened tubercles on the angle, and with two or three larger and numerous smaller revolving lines anteriorly.

Length of a broken specimen (a cast), 2 inch; width of body whorl, 1.3 inch; length of aperture, 1 inch +.

I have seen but a single specimen of this species, and that a cast, but I venture to describe it because it is so different from all the other fusiform shells in the formation, that it cannot well be mistaken. The impression on the matrix, and traces of ribs on the cast, together with small fragments of shell, show the surface to have been costate; and some plications at the oral margin of the cast, indicate either a dentate or plicate labrum. There is a trace of but a single varix, and that high up on the spire; this shows traces of numerous, well marked teeth.

Tejon Group, Arroyo de los Alisos, Tejon.

T. (T.) FUSIFORMIS, n. s.

(Pal. Cal., Vol. 1, pl. 18, fig. 45.)

SHELL small, short fusiform, spire nearly as long as aperture; whorls five and a half, angulated. Aperture moderately wide, biangular posteriorly, narrowing in advance; inner lip slightly curved and incrustated; upper portion of body whorl flattened. Surface marked by fifteen or sixteen longitudinal ribs, diminishing from the angle towards the suture, and extending anteriorly to near the middle of the shell; these are crossed by numerous revolving ribs; on the external surface can be seen one or two arrests in growth, indicated by a crowding and increase in size of lines of growth, and corresponding to a more strongly marked internal varix.

Figure, above quoted, somewhat enlarged; one of the varices is shown on the body whorl, near the aperture. Tejon Group, Tejon. Rare.

This shell was overlooked while writing the descriptions for the first volume of the California Report; and I did not detect the mistake until too late to rectify it.

BRACHYSPHINGUS, *N. Gen.*

SHELL bucciniform, short, robust, thick; spire low; aperture large, notched anteriorly; outer lip simple; inner lip incrustated with a smooth callus; surface longitudinally ribbed or striate.

The nearest allied genus to this, is *Cominella*; they differ, in the present form wanting the high spire, and the compression of the whorls near the suture, char-

acteristic of that genus; it also resembles some of the forms of *Bullia*, especially in the sub-genus *Buccinanops*, but the form of the aperture will at once distinguish them.

B. LIRATUS, Gabb.

(*Buccinum liratum*, Gabb; Pal. Cal., Vol. 1, p. 96, pl. 28, fig. 211.)

B. SINUATUS, n. s.

Pl. 26, Fig. 35.

SHELL short, thick, subovate; spire low, whorls four to four and a half, almost entirely hidden, except on their upper margin; suture variable, sometimes deep and bordered by a thickening of the succeeding whorl, sometimes almost linear; body whorl swollen in the middle, and marked by sinuous longitudinal lines of growth, and in some specimens by undulations of the same form; on the anterior part of the shell are a few minute revolving lines. Aperture broad in the middle, acute behind, narrowed in front, and deeply and narrowly notched; a rib revolves backwards from this notch around the anterior portion of the shell, occupying the former position of the notch at the successive stages of growth; outer lip simple, slightly sinuous in outline; inner lip heavily incrustated.

Length, 1.4 inch; width of body whorl, .9 inch; length of aperture, 1.1 inch.

A very variable shell, both in the height of the spire and in the intensity of the surface markings. Some specimens are perfectly smooth except for the revolving lines, while others are strongly costate by well marked but irregular sinuous longitudinal ribs produced by irregular growth.

From the Tejon Group, Martinez; found over a small area, but apparently common, where they do occur; all the specimens were obtained by Mr. Mathewson.

BULLIA, Gray.

Molopophorus, N. Sub-Gen.

Short, robust, spire moderately elevated, suture bordered by a more or less distinct carina. Surface longitudinally ribbed or

striate. Aperture obtuse behind, and very slightly notched; outer lip simple, inner lip very slightly incrusted, sinuous; anterior notch small but distinctly defined.

The present form has the carinated, or subangulated posterior portion of the whorl, characteristic of some species of the genus *Bullia*, but more nearly the shape of the sub-genus *Buccinanops*, d'Orb.

The species is of the same general style as *Bullia* (*Buccinanops*) *moniliferum*, Val., but its very low spire and small anterior notch, separate it.

B. (M.) STRIATA, n. s.

Pl. 26, Fig. 36.

SHELL small, compact; spire moderately elevated, whorls five, convex, the first two smooth, the others longitudinally ribbed; suture deep, undulated, and bordered by a rib on the top of the succeeding whorl. Surface ornamented by irregular longitudinal striæ, some of which are more elevated than the others, and form slightly sinuous ribs. Aperture broad, outer lip simple, very obscurely notched adjoining the suture; inner lip very sinuous, slightly incrusted; anterior notch deep, narrow and oblique, bordered by two faint, variable folds, which revolve obliquely around the canal.

Length, .3 inch; width, .2 inch; length of aperture, .21 inch.

Rare in the Tejon Group. Dr. Horn.

A pretty little Buccinoid shell, entirely unlike anything else in California.

TURBINELLA, Lam.

T. CRASSITESTA, n. s.

Pl. 26, Fig. 37.

SHELL moderate in size, subfusiform, thick, spire low; whorls four to four and a half, suture distinct. Surface marked by four or five large revolving ribs on the middle and upper part of the whorl, and smaller ones anteriorly, the larger of these are crossed

by twelve to fourteen broad longitudinal ribs, each point of intersection being marked by an enlargement of the revolving ribs. Aperture broad in the middle, narrowed and straight in advance; outer lip acute and undulated on the margin, inner lip thickened, flattened, and bearing two distinct oblique folds in the middle; canal produced, straight.

Length, 1.2 inch; length of aperture, 1 inch; width of body whorl, .6 inch.

Rare in the Martinez Group, Martinez. Mr. Mathewson.

MITRA, Lam.

M. CRETACEA, Gabb.

(*Mitra cretacea*, Gabb; Pal. Cal., Vol. 1, p. 103, pl. 28, fig. 215.)

Since the publication of the first volume of the Report, another specimen of this rare species has been obtained at the same locality, from the Tejon Group. It differs in some respects from the first, showing faint traces of crenulation on the angle of the upper whorls, the body whorl is more robust, and the anterior end, which was absent in the first specimen, is regularly tapering, making the aperture slightly longer than the spire. All of the whorls are more distinctly carinated on the angle than in the specimen figured.

FICOPSIS, Con.

Mr. Conrad proposed this name to include a group of thin subfusiform shells, apparently allied to *Ficus*, but with a somewhat higher spire, and a straight, or nearly straight, and somewhat produced canal. The group seems to be a well defined one, and includes numerous species in the newer Cretaceous, and in the Eocene. His type is his *Ficus penitus*, = *Pyrula cancellata*, Lea, of the Alabama Eocene.

The following Californian species belong to this type:

F. RÉMONDII, Gabb.

(*Fusus (Hemifusus) Rémondii*, Gabb; Pal. Cal., Vol. 1, p. 87, pl. 18, fig. 36.)

F. HORNII, Gabb.

(*F. (H.) Hornii*, Gabb; Pal. Cal., Vol. 1, p. 86, pl. 28, fig. 206.)

F. COOPERII, Gabb.

(*F. (H.) Cooperii*, Gabb; Pal. Cal., Vol. 1, p. 86, pl. 28, fig. 207.)

UROSZYCA, *N. Gen.*

SHELL thin, pyriform, spire very slightly elevated, body whorl long. Surface transversely striate or cancellate. Aperture broad above, narrow and produced below; outer lip simple, inner lip very slightly incrustated; canal long, slender, and slightly twisted.

This genus seems to be closely allied to *Ficopsis*, but differs from it in its more pyriform shape, and in the canal being more slender, proportionally longer, and contorted instead of being perfectly straight. Mr. Conrad has placed *Ficopsis* as the next genus to *Ficus*, and I think correctly. We have thus, at least three genera of this group, characterized by their general ficoid shape, thin shells, low spires, and more or less delicate sculpture. In the absence of the animals, it is difficult to ascertain the family relations of shells so closely allied in form as these are to some of the *Fusinae*, and it is not improbable that there are many fossil shells called by the promiscuous appellations of *Fusus* and *Pyrula*, which really belong to this family.

U. CAUDATA, *n. s.*

Pl. 27, Fig. 38.

SHELL moderately large, pyriform, spire low, whorls five, the upper rounded, the body whorl subangulated by three nearly equidistant, nodose, revolving carinae; top of whorl slightly sloping, interspaces between the ribs slightly concave, anterior portion deeply excavated. Surface crossed by numerous small revolving striae. Aperture broad, outer lip simple, inner lip slightly incrustated, canal long, slender, slightly twisted.

Length, 2.35 inch; length of aperture, 2.15 inch; width of body whorl, 1.3 inch.

Rare in the Martinez Group, Martinez. Mr. Mathewson.

Resembles somewhat *Ficopsis Cooperii* in style of ornament, but can be distinguished by its greater size, lower spire, broader body whorl, the presence of three instead of two carinae, and by the curved canal.

SYCODES, *N. Gen.*

SHELL subpyriform, nearly of the shape of an immature *Cypræa*; spire low. Aperture simple, narrowing slightly in advance, and with a shallow anterior notch; columella straight in front. Surface plain, or ornamented only by fine lines.

I described the species on which this genus is founded, in the first vol. Pal. Cal., under the generic name of *Ficus*. Since then I have been able to determine that the form is constant, and, as I then supposed, the specimens are adult. So far as I know, it is the oldest known form allied to *Ficus*, being from the Chico Group. The species is rare, all the specimens coming from a single locality.

The genus is evidently closely related to *Ficus*, differing principally in its proportionally thicker shell, in the straight, short columella, and the anterior part of the mouth continuing wide to the extremity, instead of narrowing as in all the allied genera.

S. CYPRÆOIDES, Gabb.

(? *Ficus cypræoides*, Gabb; Pal. Cal., Vol. 1, p. 58, pl. 19, fig. 105.)

EUSPIRA, Ag.

An Oolitic genus, possessing all of the leading characteristics of the following shell, the flattened and angulated upper surface of the whorls, the closed umbilicus, and slight thickening of the columellar lip. In all of its peculiarities, except the flattening of the upper portion of the volutions, it seems closely allied to *Ampullina* and *Lunatia*.

E. ALVEATA, Con. sp.

(*Natica alveata*, Con.; P. R. R. Rep., Vol. 5, p. 321, pl. 2, fig. 8.)

(*Amauropsis alveata*, Gabb; Pal. Cal., Vol. 1, p. 110, pl. 19, fig. 59; pl. 21, fig. 111.)

(*Ampullina alveata*, Con.; Smithsonian Check List, No. 459.)

Characteristic of the Martinez and Tejon Groups. Common.

NEVERITA, Risso.

N. GLOBOSA, n. s.

Pl. 27, Fig. 39.

SHELL subglobose, spire low, acute; whorls rounded, five and a half, rapidly increasing in size, the last sloping above, and slightly flattened on the side; umbilicus small but well marked. Aperture suboval, narrower above than below; outer lip simple, inner lip with a heavy callus, prominent above, slightly flattened on the inner face, the portion over the umbilicus flat, rather thin, and sometimes bearing a faint transverse groove.

Length, .75 inch; width, .72 inch; length of aperture, .68 inch; width of aperture, .32 inch.

From *Neverita secta*, its nearest ally, this shell can be distinguished by its much more globose form, the upper part of the whorl being round instead of sloping almost regularly from the apex; it is not so wide at the base; the callus is very large posteriorly, instead of being thin and narrow as in *secta*, and the portion over the umbilicus is small, rounded and flat, instead of being, as in *secta*, large, convex, and triangular.

From the Tejon Group, ten miles west of Griswold's, on the road from San Juan to New Idria, and southeast of the "Sheep Well."

AMPULLINA.

A. STRIATA, n. s.

Pl. 27, Fig. 40.

SHELL small, compact, subglobose, whorls five, rounded, suture deep, whorls in some cases rounded, subtruncated above, adjoining the suture, in other specimens regularly rounded. Surface ornamented by numerous, minute, revolving, impressed lines, more or less interrupted by the lines of growth. Aperture subovate, widest in advance; outer lip thin, simple; inner lip simple, terminated anteriorly by a narrow, flattened margin commencing in the umbilical region; umbilicus closed or minutely perforated.

Dimensions of a small specimen : Length, .68 inch ; width of body whorl, .57 inch ; length of aperture, .52 inch.

From the Martinez Group, Martinez ; Mr. Mathewson.

A variable shell, the greatest variation being in the shape of the body whorl, some specimens being much more expanded and oblique than others.

TEREBRA, Brug.

T. CALIFORNICA, n. s.

Pl. 27, Fig. 41.

SHELL small, slender, elongated, sides flattened ; whorls eleven, flattened on the sides, the body whorl slightly convex a little below the middle, and excavated below. Surface ornamented by small, slender, and slightly sinuous longitudinal ribs, the upper margin of the whorl bordered by a slightly thickened rim. Aperture elongate, outer lip simple, inner lip incrustated, canal a little deflected and twisted, notch very small.

Length, .52 inch ; width of body whorl, .08 inch ; length of aperture, .11 inch.

From the Tejon Group, Martinez ; a single specimen found by Mr. Mathewson.

CHEMNITZIA, d'Orb.

C. PLANULATA, Gabb.

(*C. Spillmanni*, Gabb (not.Con.) ; Pal. Cal., Vol. 1, p. 115, pl. 19, fig. 70.)

On examining Mr. Conrad's original specimen, I am inclined to agree with him that there are some good points of specific difference, and therefore propose the above name.

PUGNELLUS, Con.

P. HAMULUS, Gabb.

Pl. 27, Fig. 42, 42 a.

(*P. hamulus*, Gabb ; Pal. Cal., Vol. 1, p. 81, pl. 20, fig. 124 ; pl. 18, fig. 48.)

This shell is extremely variable from the changes of age. The two figures quoted above give a young shell, and one that has acquired its lip and incrustation.

In the latter, pl. 20, fig. 124, there is shown an angular notch on the outer lip, also mentioned in the description as one of the specific characters. The shell is a common one, and the discovery of numerous specimens shows that this notch is by no means constant. A very old, but small individual before me, is so heavily incrustated that its original form is entirely lost, and several expert conchologists have been, on first sight, at a loss to recognize at all, even its family relations. It shows no trace of a spire or of volutions, and the outer lip is almost as large as the body whorl, while the canal is very short, and incurves at almost a right angle to the axis of the shell. Were I less familiar with the species, I should hesitate in calling this specimen by the same specific name, but I have seen so many variations in its form, that I have no doubts whatever on the subject.

S. Gen. Gymnarus, Gabb.

P. (G.) MANUBRIATUS, Gabb.

(*Pugnellus manubriatus*, Gabb; Pal. Cal., Vol. 1, p. 125, pl. 29, fig. 229, a.)

(*Pugnellus (Gymnarus) manubriatus*, Gabb; Amer. Jour. Conch., 1868, p. 139, pl. 13, fig. 4, 5.)

In Palæontologia Indica, Gasteropoda, p. 21, Stoliczka suggests that this species may be identical with *P. contortus*, Sby. sp., which it closely resembles in sculpture. It differs in being a much more slender shell, the callosity never heavy, the outer lip more regular in form, and the anterior canal straight, instead of being incurved as in *contortus*. In the Journal of Conchology, I recently suggested a subgeneric separation, mainly on the peculiar form of the canal. I have examined a large series of specimens, and cannot agree with Dr. Stoliczka, that the thinness of the callosity is due to injury, since the same characters obtain in all the individuals. Nor is the canal broken in the specimen figured. I have never detected the slightest indication of a curve in this portion of the shell, where the specimens were perfect, or nearly so.

CYPRÆA, Linn.

S. Gen. Luponia, Gray.

C. (L.) BAYERQUEI, Gabb.

Pl. 27, Fig. 43, a, b, c.

(? *Cypræa Bayerquei*, Gabb; Pal. Cal., Vol. 1, p. 129.)

SHELL small, ovoid, convex, broadest near the upper end, gradually tapering convexly anteriorly; spire entirely hidden even

in the young shell; base sub-flattened. Aperture narrow, outer lip considerably produced posteriorly, thickened and strongly incurved, slightly carinated near the extreme anterior end, both lips bearing numerous small teeth, placed deep in the mouth, and not continued downwards to the margins. Surface smooth, or marked by indistinct longitudinal lines of growth. The young shell is thin, the lines of growth pretty distinct, the aperture broadly expanded in the middle, and apex is submerged.

A perfect specimen has been obtained in the Tejon Group at Martinez, and Dr. Horn sent me two immature ones from Tejon.

S. Gen. Epona, H. & A. Ad.

C. (E.) MATHEWSONII, n. s.

Pl. 27, Fig. 44, *a*, *b*.

SHELL small, thick, very convex, inequilateral, most convex in the middle and a little above; the outer lip straighter than the opposite side; ends but slightly produced, anterior end more than the posterior; base convex. Aperture linear, outer lip produced behind more than the inner, thickened by a callus, expanded laterally, especially towards the ends, where the margin is thinner and subacute; inner lip regularly incrustated, carinated in advance; both lips bearing a few large teeth, those on the inner lip being continued as raised lines, to a considerable distance on the face of the body whorl. Surface smooth, the limits of the thickening of the outer lip being pretty well defined.

Length, .43 inch; width, .28 inch; height, .22 inch.

This beautiful little shell has no relations in the formation. It approaches most nearly the sub-genus *Epona* of H. and A. Adams, but differs from the more typical species of that group, in the very small degree to which the ends are produced. I have never seen but a single specimen, which I obtained from Mr. Mathewson, who found it in the Tejon Group at Martinez.

ANCHURA, Con.

A. FALCIFORMIS, Gabb.

(*Aporrhais falciformis*, Gabb; Pal. Cal., Vol. 1, p. 127, pl. 20, fig. 83.)

Subsequent discoveries show that the canal of this shell is very long and straight. From being extremely slender, it is rarely preserved. One specimen from Chico Creek has an aperture, including the canal, as long as the spire. All of the species described in the above work as *Aporrhais*, belong to the genus *Anchura*.

Following the custom of nearly all writers on the subject, I have there and elsewhere, heretofore quoted *Aporrhais* as a genus of Petiver, Dacosta, &c. Recently having had my attention specially called to the subject, I investigated the history of the generic name anew for myself, and have published the result of my study in the American Journal of Conchology, 1868, page 143. Neither Aldrovandi, Petiver, nor Dacosta, ever knew the name as connected with the true *Aporrhais*. They all applied it to various species of *Pterocera*; a good opportunity for some conchological revolutionist to make another "restoration," and quote *Pterocera* as the genus *Aporrhais* of Aristotle, Aldrovandi, *et id omne genus*.

A. TRANSVERSA, n. s.

Pl. 27, Fig. 45.

SHELL small, fusiform, spire elevated; whorls rounded, their number unknown, suture deep. Surface of upper whorls, and upper part of body whorl, strongly cancellated by longitudinal and transverse ribs; body whorl strongly carinated near the lip, the carina running out, and forming a sort of midrib or keel to the lip. Lip long, transverse, curved upwards, the upper margin regularly concave, tip acute, lower margin broken; canal long, straight.

Length unknown; about .7 inch; width of body whorl, .2 inch; including length of lip, .5 inch.

From the Martinez Group, Martinez.

? *A. CARINIFERA*, n. s.

Pl. 28, Fig. 46.

I propose this name for a minute shell, of which I have but a single rather imperfect cast. It is short, robust fusiform, the whorls rounded, the body whorl tapering gradually in advance, instead of ending in a slender canal, as in the typical *Anchuras*. The lower whorls carry a single prominent rib on the middle, and the margin of the mouth is broken where (if it is an *Anchura*) the lip process should take its rise; the whole surface is ornamented by numerous revolving striæ, visible both on the shell and, to a less degree, on the cast, becoming strongly marked on the inner margin of the outer lip.

Length of the fragment, less two or three volutions of the apex, .32 inch.

From the Martinez Group, Martinez.

I have referred this little shell to the genus *Anchura*, with considerable hesitation, because I have no proof that it possessed the expanded lip, and because the anterior canal, which in all the known species is slender, and more or less produced, is, in this case, short and robust. Further specimens will be necessary before its true generic relations can be definitely settled.

HELICAULAX, Gabb.*H. BICARINATA*, n. s.

Pl. 27, Fig. 47.

SHELL robust fusiform, spire elevated; whorls six; sides regularly sloping, body whorl bicarinate, the upper edge of the whorl joining the upper carina of the preceding volution, so as to produce a continuous slope to the apex. Surface marked by numerous, minute revolving lines, one or two of which, below the lower angle of the body whorl, are larger than the others; a series of small nodes on each carina of the last whorl. Aperture broad, continued posteriorly by a long, slender canal running up the spire to near the apex, and then curving outwards and backwards;

outer lip expanded, biangular, bordered by a thickened margin, the posterior and lateral margins concave, a digitate process at the posterior angle; anterior angle (not produced?); inner lip expanded over the front of the body whorl, and continued up the spire as high as the canal, very much thickened and longitudinally striate on the outer margin; canal and anterior portions of the shell unknown.

Length, less all of the anterior canal, 1. inch; width of body whorl, .45 inch; width, including outer lip, .9 inch.

From the Shasta Group, Cottonwood Creek, Shasta County.

A peculiar shell, easily distinguished even in fragments by the regular slope of the spire, the biangular form of the body whorl, the heavy incrustation of the inner lip, and the long, solid posterior canal. The genus, proposed by me in *Amer. Jour. Conchology*, 1868, page 145, is a strongly characterized member of the *Aporrhaidæ*, and seems to be the nearest ally of *Aporrhais* in the Cretaceous, having many of the characters of that genus, and forming the link between it and *Anchura*; the lip being much more like the latter than the former genus, unless perfect specimens of the present species should prove, by being bi-digitate, that this is not a constant character.

H. COSTATA, n. s.

Pl. 28, Fig. 48.

SHELL small, broadly fusiform, spire elevated; whorls six or seven, angulated in the middle, sloping, and nearly straight above, slightly convex below; above the angle are numerous fine striæ, below are five or six subacute revolving ribs, with broad concave interspaces. Aperture broad above, narrowed in front, posterior canal well marked, and curving backwards; outer lip and anterior canal unknown; inner lip thinly incrustated.

Length, less the anterior canal, .47 inch; width of body whorl, .3 inch.

From the Martinez Group, Martinez.

A little shell, strongly characterized by its revolving ribs, and very angular whorls. The posterior canal, in the specimen, reaches to the second whorl above the aperture, and seems to have been attached to the spire still further, before being deflected; the groove is unusually deep, and the specimen was probably not entirely mature, judging both from this character, and from the thinness of the inner lip, which, in all the other species, is heavily incrustated.

LOXOTREMA, Gabb.

L. TURRITA, n. s.

Pl. 28, Fig. 49.

SHELL elongated, turreted, spire elevated, nearly twice the length of the aperture; whorls about six to six and a half, slightly convex on the sides, abruptly truncated and flat on the upper margin. Body whorl marked by eight or ten revolving lines on the anterior half, crossed by sinuous lines of growth; both sets of markings being very variable in distinctness in different specimens. Aperture obliquely subquadrate, bordered on the inner side by a raised lip, the top retreating upwards, and very obliquely backwards; outer lip thick above and below, very thin in the middle, and with a strongly sinuous margin, most prominent near the anterior end; inner lip thick, its margin somewhat raised above the surface of the body whorl; anterior extremity of aperture not notched, but produced, and slightly channelled.

Length, 1.65 inch; width of body whorl, .8 inch; length of aperture (internal measure), .6 inch; width, .45 inch.

Common in the Tejon Group, ten miles west of Griswold's, between San Juan and New Idria.

This very peculiar shell is evidently closely allied to *Struthiolaria*, but differs in the shape of its volutions, the elevated spire, and the retreating backwards of the posterior margin of the aperture. It has the characteristic lip-like anterior end of that genus, and its sinuous outer lip. A marked character is the extreme thinness of the middle of the whorl, and the equally unusual thickness of the walls both above and below this point, rendering it almost impossible to obtain a specimen in which the middle of the outer lip is not broken away.

ATRESIUS, N. Gen.

SHELL elongate, spire elevated; whorls rounded, aperture ovate, slightly produced in front, outer lip entire, thin; columella not incrustated, imperforate; surface marked by revolving ribs.

A non-pearly shell, resembling *Tuba*, Lea, and *Spironema*, Meek, but differing from both in being entirely imperforate, showing no trace even, of an umbilical depression. It is most probably a member of the *Littorinidæ*, and should be placed near *Spironema*.

A. LIRATUS, n. s.

Pl. 28, Fig. 50.

SHELL small, thin, elongate; spire elevated, number of whorls unknown, whorls regularly convex, suture linear. Surface marked by about fourteen or fifteen subacute revolving ribs with concave interspaces, the space between the upper rib and the suture twice as broad as those below, first rib minutely crenulated, the whole surface crossed by fine but distinct lines of growth. Aperture subovate, a little produced and subangular in front, outer lip simple, thin, and showing faint traces internally of the ribs on the surface, columella curved.

Length (broken), .43 inch; total length, .55 inch?; width of body whorl, .37 inch; length of aperture, .28 inch.

From the Shasta Group, Colusa County, southeast of the Hot Sulphur Springs.

TURRITELLA, Lam.

T. MARTINEZENSIS, n. s.

Pl. 28, Fig. 51.

SHELL robust, apical angle broad; whorls twelve, angulated, flat to concave above and below the angle; body whorl with two angles, the lower less prominent than the upper; in the spire but one angle is visible, the upper edge of the whorl being applied to the lower angle of its predecessor. Surface marked by two or three strong lines on the upper face, one between the revolving angles, and sometimes one or two below; besides there are numerous fine revolving lines, all crossed by faint striæ of growth. Aperture broad, outer lip slightly sinuous, inner lip flattened and somewhat twisted.

Length, 2.3 inches; width of body whorl, .95 inch; length of aperture, .55 inch.

From beds intermediate between the Martinez and Tejon Groups, Martinez. Numerous specimens were obtained at a single locality by Mr. Mathewson.

This shell is entirely unlike any other Californian Cretaceous *Turritella*, and resembles in its style of ornament some of the Eastern Miocene species. It can be easily identified by its prominent single angle on each whorl of the spire, and by its broadly expanding form, approaching in this character to *T. robusta* of the Chico Group.

NERITA, Linn.

S. Gen. Theliostyla, Mörch.

N. (T.) TRIANGULATA, n. s.

Pl. 28, Fig. 52, 52 a.

SHELL small, thick, semi-ovoid, spire flattened; whorls two or two and a half, rapidly increasing in size. Surface divided by three angles into four nearly equal revolving planes, each plane marked by four or five rounded ribs with equal interspaces. Mouth rounded subquadrate, outer lip subacute on the margin, very thick behind, and internally toothed; inner lip broadly expanded, nearly straight on its internal edge, and bearing a few large teeth, its surface coarsely pustulated.

Length, .28 inch; width, .38 inch; height, .25 inch.

Not common in the Tejon Group at New Idria, where I found but two specimens. It has never been encountered elsewhere.

CALLIOSTOMA, Swains.

Zizyphinus, Gray.

C. RADIATUM, n. s.

Pl. 28, Fig. 53.

SHELL minute, broadly conical; whorls four (or more), sides flat, sloping; suture well marked. Surface ornamented by fourteen or fifteen large radiating ribs, which produce an undulation

of the upper margin of the whorl, and abut against a strongly marked revolving rib bordering the lower angle; these are crossed by six or seven smaller revolving elevated lines; under surface marked by numerous, minute, revolving striæ. Aperture subquadrate; inner lip straight, slightly oblique and thickened.

Length, .16 inch; width, .18 inch.

This species is known by but a single specimen from the Chico Group of Texas Flat, Placer County. It is not improbably a young shell, though it already possesses four volutions. It has so well-marked a series of characters that I have ventured to describe it, since it cannot be confounded with any known species.

ATAPHRUS, *N. Gen.*

SHELL thick, flattened subglobose. Surface smooth. Aperture subovate, oblique; outer lip simple, inner lip thick, rounded, uniting with the outer lip by a regular curve; umbilicus entirely hidden.

The present genus seems to occupy an intermediate position between the recent genera *Oxystele*, Phil., and *Photinula*, H. and A. Adams. From the former it differs in having a rounded columella, instead of flattened; while from the latter, it can be distinguished by its smooth surface and the junction between the labrum and labium being by a regular curve in front, instead of the columella terminating in a point near the external edge, as in *Photinula*.

A. CRASSUS, *n. s.*

Pl. 28, Fig. 54.

SHELL small, thick, flattened subglobose, spire low; whorls four, rounded, revolving a little obliquely; body whorl slightly flattened below. Surface marked only by lines of growth. Aperture oblique, subcircular, columellar lip thick and rounded; umbilical region covered by a smooth callus, which merges insensibly into the general surface.

Length, .18 inch; width, .28 inch.

Rare in the Martinez Group (?) at Martinez. Specimens were sent me by Mr. Mathewson, but not so labelled that I can determine their horizon, and they are so carefully trimmed out of the matrix that I have no associated species to assist me.

MARGARITELLA, M. & H.

M. ANGULATA, n. s.

Pl. 28, Fig. 55.

SHELL small, thin, highly polished, spire elevated; whorls four and a half, convexly flattened on the sides, more or less truncated above; body whorl very slightly convex on the base. Surface bearing one, two, or three strongly impressed lines near the suture, crossed by oblique impressed lines forming variable series of crenulations; these oblique lines rarely extend far down on the sides, but hold the same direction as the lines of growth, which can occasionally be traced their entire length; besides these, there are sometimes faint revolving lines visible over the entire surface, more constant on the base; umbilicus moderate, its margin evenly crenulated, its internal surface marked by strong revolving and radiating lines. Aperture subquadrate, margins simple.

Length, .25 inch; width, .23 inch.

From the Martinez or Chico Group, Martinez. There is a small deposit of the latter group near Martinez, and judging from the lithological character of the specimens, they seem to have come from it; they were sent me by Mr. Mathewson.

This species can be distinguished from *M. crenulata* by its higher spire and narrower umbilicus; they approach each other in the crenulation of the top of the whorl and the umbilical margin.

ACMÆA, Esch.

? *A. TEJONENSIS*, n. s.

Pl. 28, Fig. 56.

SHELL small, low, ends unequal; anterior end broad, sides converging posteriorly; posterior end narrow, rounded; apex subcentral, slightly curved forwards. Surface marked by a few concentric lines, and six or eight faint radiating undulations.

Length, .35 inch; greatest width, .25 inch; height, .1 inch.

A small inconspicuous species from the Tejon Group, Tejon; Dr. Horn. It can be distinguished from ? *A. (Patella) Traskii*, of the Chico Group, by its ovate instead of elliptical outline, and by the beak curving markedly in advance; the radiating ornaments are also much less marked than in the Northern shell.

ACTÆONINA, d'Orb.

A. PUPOIDES, Gabb.

Pl. 28, Fig. 57.

(? *A. pupoides*, Gabb; Pal. Cal., Vol. 1, p. 67, pl. 19, fig. 113.)

This shell was described from a single specimen in which the anterior half was broken away. I have since been able to verify my determination of the genus, and to ascertain the remaining characters of the species. The apex is variable, the form figured being the most common; in some cases it is higher, in others more blunt. The aperture is small, narrowed behind, rounded in advance; outer lip acute, slightly sinuous; inner lip heavily incrustated in advance by a broad, non-plicate callus, which extends around the anterior margin of the mouth, becoming regularly smaller, and disappearing at the anterior end of the outer lip.

The figure is natural size.

From the Shasta Group, Cottonwood Creek.

ACTÆONELLA, d'Orb.

A. OVIFORMIS, n. s.

Pl. 28, Fig. 58.

SHELL elongate ovoid, sides nearly parallel in the middle; spire unknown, whorls five or more, nearly straight on the sides, tapering, rounded in advance. Aperture narrow, straight, a little wider in front, inner lip heavily incrustated in advance, and with two moderate folds. Surface plain.

Length (less the spire, broken away), 1.8 inch; width of body whorl, .85 inch.

A single broken specimen from the Chico Group, (?) Cottonwood Creek, Shasta County; easily distinguished by its slender form and subparallel sides.

LIOCIUM, *N. Gen.*

SHELL elongate, spire high, apex dextral. Surface polished and ornamented by striae or punctate markings. Aperture ovate, not emarginate anteriorly; outer lip slightly sinuous, and bordered by a thickened rim; inner lip incrusted and smooth, bearing no folds.

The thickened lip, incrusted columella, shell texture, and sculpture of the surface of this shell, point to an alliance with *Cinulia* (*Avellana*) and *Ringinella*; while its elevated spire, entire anterior end of the aperture, and the absence of teeth or folds, sufficiently separate it from all known genera of the family.

L. PUNCTATUM, n. s.

Pl. 28, Fig. 59.

SHELL minute, elongate, slender, spire elevated; whorls seven, very slightly convex, suture faint, extreme apex rather blunt. Surface highly polished, and marked anteriorly by a few faint revolving lines of punctations. Aperture elongate oval, acute posteriorly; outer lip slightly sinuous, bordered by a thickened rim, about twice as thick as the shell walls, and longitudinally striate: this thickening continues uninterruptedly around the anterior end of the mouth; inner lip incrusted, smooth.

Length, .18 inch; width of body whorl, .06 inch; length of aperture, .06 inch.

Rare in the Shasta Group, south of the road from Colusa to the Hot Sulphur Springs in the first range of Foot Hills, Colusa County, associated with *Cordiaera mitraeformis*, *Atresius liratus*, and the following species. It is a beautiful little shell, and can be at once recognized by its minute size, slender form, polished surface, and by the characteristic punctate sculpture.

RINGINELLA, d'Orb.

R. POLITA, n. s.

Pl. 28, Fig. 60.

SHELL small, subovate, spire prominent; whorls six, rounded, body whorl slightly flattened on the sides, narrowing in advance,

suture linear, impressed. Surface marked by a few, distant, impressed, revolving lines, variable in number. Aperture long, rounded in advance, inner lip bearing one large and one smaller and less prominent fold in advance.

Length, .4 inch; width of body whorl, .24 inch; length of aperture, .27 inch. Not rare, with the preceding species.

This shell can be distinguished from all previously described members of the family in California, by the simple style of its sculpture, consisting of simple impressed lines; *R. (Cinulia) pinguis* having elevated ribs, *Ringicula varia* having grooves crossed by minute elevated lines, and the others being too different in shape to permit of a confusion.

R. PINGUIS, Gabb.

(*Cinulia pinguis*, Gabb; Pal. Cal., Vol. 1, p. 112, pl. 29, fig. 221.)

ACEPHALA.

MARTESIA, Leach.

M. CLAUSA, Gabb.

(*M. clausa*, Gabb; Pal. Cal., Vol. 1, p. 145, pl. 22, fig. 115.)

This species was described from the Chico Group. During the last two or three years several specimens have been obtained from the Martinez Group, at Martinez, and from the Tejon Group at Martinez, ten miles west of Griswold's and Tejon. In these more recent forms I can find no characters different from the original type; and Mr. Tryon, whose great experience in this family renders his opinion of especial weight, agrees with me in believing them all to belong to the same species.

SOLEN, Linn.

S. Gen. *Hypogella*, Gray.

S. (H.) CUNEATUS, n. s.

Pl. 29, Fig. 61.

SHELL small, narrowed anteriorly, wider behind; hinge margin straight; beaks anterior, subterminal; margin slightly excavated

under the beaks; anterior end narrowly rounded; posterior end broadly convex; base slightly sloping, and nearly straight; surface faintly marked by lines of growth.

Length, 1.25 inch; width under the beaks, .3 inch; width near the posterior end, .4 inch.

A rare shell from the Martinez Group, Martinez.

It can be distinguished from the young of *Solen parallelus*, by its widening posteriorly, and by the prominent beaks. From *S. (Hypogella) Diegoensis*, it differs in all the details of form.

S. (H.) DIEGOENSIS, Gabb.

(*S. (Solena) Diegoensis*, Gabb; Pal. Cal., Vol. 1, p. 213, pl. 32, fig. 280.)

(*Plectosolen Diegoensis*, Con.; Smithsonian Check List, No. 240.)

When I used Browne's name for this subgenus, I did it without knowing the date of its publication, having been misled by H. and A. Adams. Scientific research in a new country, away from large libraries, is attended with great difficulties, such as only those who have had the experience, can understand. As I have already intimated elsewhere, I strongly disapprove of the use of pre-Linnæan names in science, believing that the only way to arrive at a settled nomenclature, is to fix some definite date, behind which we cannot go, as has been done by the British Association. Gray's name of *Hypogella* is the oldest that we can use according to this rule. The name *Plectosolen*, was proposed by Mr. Conrad, without a description; and he has since informed me that he has abandoned it, finding it to be founded on untenable characters

CORBULA, Brug.

C. HORNII, Gabb.

Pl. 29, Fig. 62, *a*, *b*.

(*C. Hornii*, Gabb; Pal. Cal., Vol. 1, p. 149, pl. 29, fig. 128.

This species was described from a cast of a left valve and a broken right valve, Subsequently Dr. Horn sent me four other specimens, which enable me to correct some points in the diagnosis. The shell is almost exactly equivalve, the anterior end not usually so produced as in the figure quoted above; the left valve is strongly angulated posteriorly, the right valve not so much so; the surface is marked by fine and pretty regular concentric lines.

C. ALÆFORMIS, n. s.

Pl. 29, Fig. 63.

SHELL large, broadly rounded in advance, narrow, produced, and truncated behind; beaks about a third of the length from the anterior end, high; posterior cardinal margin nearly straight, bordered by a broad, deep groove, extending from the beaks to the posterior end; base prominently and broadly rounded in the middle, sinuous behind. Surface marked by small, regular, concentric ribs.

Figure, natural size.

From a bed intermediate in age between the Martinez and Tejon Groups, near Lower Lake village, Lake County.

The largest of our Californian *Corbular*, and characterized by its narrow produced posterior end.

ANATINA, Lam.

A. QUADRATA, n. s.

Pl. 29, Fig. 64.

SHELL moderate in size, subquadrate; beaks nearly central; length and width about as eight to five; anterior end gaping, truncated, and with the corners rounded; posterior end convexly subtruncated, or rounded; base nearly straight, being a very slight curve, most prominent in the middle; the cardinal margin is slightly excavated in advance of the beaks, and sloping and nearly straight posteriorly. Surface marked by a few lines of growth.

Length, 2. inches; width, 1.25 inch.

From the greenish rock on the north shore of Departure Bay, Nanaimo, Vancouver Island; associated with *Pecten Traskii*, *Trigonia Evansana*, and other species characteristic of the Chico Group in California.

Of somewhat the style of *A. lata*, but longer and more regularly quadrate; from *A. Tryoniana* it can be distinguished by being shorter, the ends being more distinctly truncated, and by its wanting the angular ridge descending from the beaks; from *A. inæquilateralis* it can be known by the more central position of the beaks, and the less rounded ends.

PHOLADOMYA, Sby.

P. OREGONENSIS, n. s.

Pl. 29, Fig. 65.

SHELL small; beaks large, prominent, anterior; anterior end sloping outwards and downwards from the beaks, nearly straight above, narrowly rounded below; posterior end prominently rounded, a little the most prominent above the middle; cardinal margin nearly straight behind the beaks; base broadly and regularly convex. Surface marked by small but pretty regular concentric lines, crossed by a few faint radiating ridges, three or four of which, on the middle and anterior end, are distinct, the others obsolete.

Length, 1.2 inch; width, 7 inch.

Rare in the Chico Group, near the Toll House at the summit of the Siskiyou Mountains, near the southern boundary of Oregon.

From *P. nasuta*, this shell can be distinguished by its flatter form, the absence of the anterior truncation, its regularly rounded posterior end, and its obsolete radiating ribs. There is no other species on the West Coast, with which it could be confounded. *P. subelongata*, Meek, from Vancouver Island, has many more ribs, and they are most marked on the posterior portions of the surface.

PLEUROMYA, Agas.

P. PAPYRACEA, n. s.

Pl. 29, Fig. 66.

SHELL very thin, beaks prominent, and placed about a third of the length from the anterior end; cardinal margin sloping slightly, and nearly straight posteriorly, anterior end excavated under the beaks, and abruptly truncated below, very slightly gaping; posterior end narrowly rounded, gaping more than the anterior; base broadly convex. Surface ornamented by irregular concentric ribs. Posterior muscular scar small; pallial sinus broad and deep.

Length, 1.7 inch; width, 1.2 inch; thickness, .75 inch.

From Cottonwood Creek, probably from the Shasta Group. A number of specimens were collected by Mr. Mathewson in 1865, from a dark-colored rock, in which he does not seem to have found any other fossil; and beyond the meagre label, "Cottonwood," I have no information.

ARCOMYA, Agas.

A. UNDULATA, n. s.

Pl. 29, Fig. 67.

SHELL very inequilateral, beaks prominent, strongly incurved, and placed about a third of the length from the anterior end; cardinal line nearly straight; base slightly convex; ends rounded, subtruncated, and nearly equal; both ends slightly gaping. Surface unknown, surface of the cast marked by a few large, concentric undulations.

Length, 2.25 inches; width, 1.3 inch; transverse diameter, .9 inch.

A single specimen, from Indian Creek, Butte County, belonging to Mr. Voy, of Oakland, who kindly loaned it to me for description.

Easily distinguished by its peculiar arcæform shape, from any other known fossil of California.

HOMOMYA, Agas.

H. CONCENTRICA, Gabb.

(*Panopæa id.*, Gabb; Pal. Cal., Vol. 1, p. 148, pl. 22, fig. 119.)

From the Chico Group, of Tuscan Springs, Cottonwood Creek, and Martinez.

MACTRA, Linn.

? M. TENUISSIMA, n. s.

Pl. 29, Fig. 68.

SHELL small, extremely thin, subequilateral; beaks central, small, pointed slightly in advance; anterior end broadly and regularly rounded; posterior end obliquely and convexly sub-

truncated; base regularly convex. Surface marked by minute, concentric striæ of growth; an angulated ridge runs from the umbones to the posterior basal angle. Pallial sinus deep and narrow.

Length, 1.1 inch; width, .8 inch; depth of one valve, .15 inch

A single specimen, from the Martinez Group, Martinez.

I have had this specimen a number of years, and have heretofore hesitated to describe it, hoping to obtain others, which would settle its exact generic relations. That it belongs to the Linnæan genus *Mactra*, and even to that genus as restricted by Lamarck, I have little doubt; but from the nature of the matrix, and the extreme tenuity of the shell, it is impossible to expose the hinge, and I am therefore unable to assign it at present, with any degree of certainty, to its proper place among the numerous closely allied genera of the family.

CYMBOPHORA, *N. Gen.*

Pl. 29, Fig. 69.

I propose this genus for one of the most common fossils of the Californian Cretaceous, *Mactra Ashburnerii*. The hinge is composed of a rather heavy hinge-plate, bearing a cartilage-pit, not sunk into its substance, as in the others of the *Mactridæ*, but, as it were, built up on its surface; a small, delicate, spoon-shaped process, laid obliquely under the beaks, its base being on, or slightly above the level of the hinge-plate; in the right valve the cardinal tooth is single, very delicate, and nearly at a right angle with the anterior wall of the cartilage-pit; in the left valve the tooth is V-shaped, entirely separated from the pit, very slender, and articulates between the tooth and the pit of the opposite side; the lateral teeth are large and comparatively very robust.

This genus seems to be most nearly allied to *Trigonella*, H. and A. Ad., as figured in Genera of Recent Mollusca, but differs in the character of the cartilage-pit, in the laterals being more robust, and in the cardinal teeth of the left valve being more removed from the pit.

C. ASHBURNERII, Gabb.

(*Mastra Ashburnerii*, Gabb ; Pal. Cal., Vol. 1, p. 153, pl. 22, fig. 127.)

Very characteristic of the Chico Group, and extending as high up as the Tejon Group, being found at all of the typical localities of both of these, as well as of the included Martinez Group.

ASAPHIS, Modeer.

A. MULTICOSTATA, n. s.

Pl. 29, Fig. 70.

SHELL small, elongate subquadrate, inequilateral; beaks nearly central; cardinal margin sloping towards both ends, concavely in advance, convexly behind; base broadly and regularly convex; anterior end rounded; posterior obsoletely and obliquely sub-truncated, convex; a broad, rounded angle running from the beaks to the posterior basal margin. Surface marked by about sixty small radiating ribs with somewhat wider interspaces, and crossed by a few lines of growth. Muscular scars large; pallial line unknown; an internal thickening runs obliquely downwards and forwards from the beaks to the anterior muscular scar, forming a marked depression on the cast.

Length, .68 inch; width, .4 inch; height of single valve, .1 inch.

A single mould and an internal cast, from the Crooked Creek of the Des Chutes River, Central Oregon, east of the Cascade Mountains; associated with *Trigonia Evansana*, *Turritiles Oregonensis*, and other species, characteristic of the Chico Group. These specimens, beyond a doubt of the same age as the fossils near Jacksonville and on the Siskiyou Mountains, in Southern Oregon, were obtained by me in 1864, while in Eastern Oregon. The occurrence of the formation east of the Cascade range, as proved by these fossils, was published in January, 1867, by Professor Whitney, in the Proceedings of the California Academy of Natural Sciences, Vol. 3, page 309. In July, 1867, Professor Blake announced the same fact, as a new discovery, in the American Journal of Science, page 118. I merely call attention to the circumstance here, to forestall any discussion on the claim to priority of discovery, that might otherwise arise in the future; profiting by our experience in similar cases in the past.

TELLINA, Linn.

T. RÉMONDII, Gabb.

Pl. 29, Fig. 71.

(T. Rémondii, Gabb; Pal. Cal., Vol. 1, p. 156, pl. 22, fig. 132.)

Since publishing the original description and figure of this species, other and better specimens have been obtained, and I am enabled to illustrate a more perfect and older individual than in the first instance. A slight difference will be observed in the line running posteriorly from the beak in the two figures, and the concentric ribs also seem to vary in size.

The present specimen, from my own cabinet, was obtained by Dr. Horn at Tejon.

T. HOFFMANNIANA, Gabb.

Pl. 30, Fig. 72.

(T. Hoffmanniana, Gabb; Pal. Cal., Vol. 1, p. 156, pl. 22, fig. 133, 133 a.)

This rather variable species is extremely common in the Martinez Group at Martinez, and has been found in the Chico Group at Pence's Ranch, as well as in the Tejon Group at Griswold's. I have now a single specimen from the latter group from Martinez, associated with *Turritella Uvasana*, and other characteristic species. The present figure illustrates a common, and one of the most marked forms of the Martinez Group, Martinez, from the same bed with *Pugnellus hamulus*.

T. ÆQUALIS, n. s.

Pl. 29, Fig. 73.

SHELL moderate in size, nearly elliptical, thin, flattened; narrow in its young state, proportionally broader as it grows older; beaks very slightly in advance of the centre, small; cardinal margins slightly convex; base broadly and regularly curved; ends rounded, the anterior a little the narrowest. Surface marked by lines of growth, most prominent near the extremities.

Figure, natural size.

Rare in the Martinez Group at Martinez.

From *T. ooides* it can be distinguished by its central beaks and nearly equal ends;

from *T. Mathewsonii* by its more symmetrical form, the outline forming a nearly regular ellipse; and from *T. Hornii* by that species being very much longer in proportion to its width.

T. UNDULIFERA, n. s.

Pl. 30, Fig. 74.

SHELL moderately large, thin, slightly convex, very inequilateral, broadly rounded in advance, tapering behind; beaks two-fifths of the length from the anterior end, slightly pointed in advance; cardinal margin sloping rapidly and with a slight convexity to the posterior end, which is narrowly rounded; base prominent, convex. Surface marked by concentric ribs, forming large undulations towards the beaks, and gradually diminishing towards the base.

Length, 1.65 inch; width, 1.4 inch; height of single valve, .2 inch.

From a soft, gray sandstone, west of Martinez, probably belonging near the upper portion of the Martinez Group.

The shell is, in all cases, so softened by decomposition that I am unable, in any of the specimens, to expose the hinge, and therefore refer the species to the above genus with some hesitation. Judging from the imperfect impressions left on some internal casts, the hinge has been very delicate, and seems more like that of a *Tellina* than of any other genus, though the external form and general appearance render this determination somewhat doubtful.

In outline the shell is not unlike *T. ooides*, but the posterior end is narrower, the beaks are more prominent, the surface is more convex, and the style of ornament will serve at once to distinguish the two species.

DONAX, Linn.

D. LATUS, n. s.

Pl. 30, Fig. 75.

SHELL broad, triangular, thin, very inequilateral; beaks high, placed about two-fifths of the length from the anterior end; sides sloping, nearly straight, a rounded angle running from the beaks to the posterior basal margin, leaving a narrow area parallel with

the posterior side; base broadly and pretty regularly convex, joining the other two sides of the triangle by narrowly rounded angles. Internal basal margin minutely dentate, the dentations corresponding with the external ribs. Surface ornamented by numerous fine, regular, radiating ribs, flattened on top, and with the interspaces somewhat narrower than the ribs.

Length, 1.1 inch; width, .8 inch; height of single valve, .18 inch.

Rare in the Tejon Group, ten miles west of Griswold's, southeast of the Sheep Well, on the road from San Juan to New Idria.

This shell is remarkable for its thinness, and as much of the hinge as I have been able to expose, shares the delicate character of the shell itself.

VENUS, Linn.

V. *ÆQUILATERALIS*, n. s.

Pl. 30, Fig. 76.

SHELL small, triangular, the three sides forming a nearly equilateral triangle, with curved sides; beaks small, pointed forwards, and placed very slightly in advance of the middle; cardinal margin sloping rapidly and slightly convex; base broadly and not very prominently convex, rounding up in advance, and uniting by a short curve with the anterior end; the posterior basal angle is much more acute than the anterior; anterior margin slightly excavated under the beaks, nearly straight below. Surface marked by small concentric ribs. Hinge composed of short, robust teeth; muscular scars large, the anterior being the deepest and most strongly marked; pallial sinus shallow; internal margin plain.

Length, .85 inch; width, .75 inch; height of single valve, .2 inch.

From the Tejon Group, from San Diego.

The nearest ally of this species is *V. lenticularis*, G., from Benicia, but the two shells can be easily distinguished by the more marked triangular form, and smaller size of the present one, and by the absence of a lunule, or, if it does exist, by its being large and very faintly marked. In *V. lenticularis* the lunule is small but distinct.

MERETRIX, Lam.

? *M. FRAGILIS*, n. s.

Pl. 30, Fig. 77.

SHELL small, extremely thin, elongate; beaks placed about two-fifths of the length from the anterior end, prominent and pointed in advance; anterior margin excavated under the beaks, broadly rounded below; posterior ends regularly but more narrowly rounded; cardinal margin sloping convexly; base convex, most prominent under the beaks. Surface marked by concentric striae, in some cases as visible on the cast as externally. Pallial sinus deep, oblique.

Length, .8 inch; width, .65 inch; depth of single valve, .15 inch.

Rare in the Martinez Group at Martinez, associated with *Meekia sella*, *Pugnellus hamulus*, &c.

Allied in form to *M. arata* of the Chico Group, but differs in the details of outline, in its marked thinness, and in the surface ornament.

M. HORNII, Gabb. —

Pl. 30, Fig. 78.

(*Meretrix Hornii*, Gabb; Pal. Cal., Vol. 1, p. 164, pl. 23, fig. 144.)

As I stated in a note to the description of this species (*loc. cit.*) the figure in the first volume was not good. I now avail myself of the opportunity of correcting the error by the publication of a more accurate illustration.

CARYATIS, Roem.

In a monograph of the Linnæan genus *Venus*, Dr. Roemer adopts *Cytherea*, Lam., as a sub-genus, and proposes a "section" *Caryatis*, to receive a large group of species characterized by a more or less trigonal form; a shallow or superficial lunule, bordered by an impressed line; a narrow, subelongate, immersed ligament; a triangular pallial sinus with an obtuse apex; a thin, smooth, internal margin; and with a hinge composed of three divergent cardinal teeth, the anterior thin and direct, the posterior large and oblique, and with a remote posterior lateral. These

characters are certainly of sufficient value to separate the group as a distinct genus, which, in addition to the living species, comprises numerous fossils in the Eocene, and some in the Cretaceous.

C. NITIDA, Gabb.

Pl. 30, Fig. 79.

(*Meretrix nitida*, Gabb; Pal. Cal., Vol. 1, p. 165, pl. 23, fig. 145, 146.)

A fine shell, very variable in form in different stages of growth, and characteristic of the Chico Group. The present figure is from a young shell, from Martinez. The largest specimen I have seen is nearly two inches in length.

THETIS, Sby.

? T. ELONGATA, n. s.

Pl. 30, Fig. 80, 80 a.

SHELL small, very thin, subquadrate, gibbous, elongate; beaks large, incurved, a fourth of the length from the anterior end; cardinal margin sloping and nearly straight; anterior end deeply excavated under the beaks, rounded below, and merging by a regular curve into the base, which is broadly convex, and most prominent in the middle; posterior end obliquely truncated; a strongly marked subangular ridge runs from the beaks to the posterior basal angle; behind which the surface is slightly concave. Surface marked by very minute lines of growth.

Length, .52 inch; width, .44 inch; diameter through both valves, .38 inch.

Not rare at a single locality in the vicinity of Cottonwood Creek, from either the Chico or Shasta Group. Mr. Mathewson collected a considerable number of specimens in 1865, from a gray rock, different from any bed with which I am acquainted, and which seems to have yielded no other species. The shell is of extraordinary thinness and delicacy, and is so transparent that, in some cases, its presence can only be detected by the opacity of the thickened cardinal margin. On account of its extreme delicacy, I have not even attempted the futile task of exposing the hinge, and have referred it doubtfully to the above genus, from its general appearance, rather than from any character that it possesses.

CARDIUM, Linn.

C. (LÆVICARDIUM) ANNULATUM, Gabb.

Pl. 30, Fig. 81.

(C. (Lævicardium) annulatum, Gabb; Pal. Cal., Vol. 1, p. 171, pl. 23, fig. 152.)

This beautiful and delicate shell was described and figured from a distorted specimen. Since the publication of Volume 1, numerous specimens have been obtained by Mr. Mathewson at Martinez, and I am enabled to correct a point in the description, and to give a more accurate figure of its form. The posterior side, instead of being regularly convex, is slightly truncated obliquely.

It is characteristic of the Chico Group, and seems peculiar to a series of hard beds of this group found at Martinez, south of Mount Diablo, and in Orestimba Cañon, in the same range, further south.

C. (PROTOCARDIUM) TRANSLUCIDUM, n. s.

Pl. 30, Fig. 82, 82 a.

SHELL small, thin, gibbous, rounded subquadrate; beaks prominent, incurved; ends nearly equal, the anterior rounded, posterior rounded subtruncate; base broadly rounded, a little more prominent in advance than behind. Surface marked by a few small, regular, rounded, radiating ribs on the posterior side, and by concentric lines of growth.

Length, .3 inch; width, .3 inch; diameter, .23 inch.

From the same bed as the preceding, Martinez.

Resembling *C. (P.) Placerensis*, this shell differs in its outline, being more quadrate, in the posterior radiating ribs being more regular and numerous, and in the entire absence of the large rib on the margin of the costate area, the marginal rib in this species differing in no respect from the others.

CARDITA, Brug.

C. HORNII, Gabb.

Pl. 30, Fig. 83, a.

*(Cardita Hornii, Gabb; Pal. Cal., Vol. 1, p. 174, pl. 24, fig. 157.)**(Cardita planicosta, Con. (not Lam.); P. R. R. Rep., Vol. 5, p. 321, pl. 2, fig. 6.)*

This shell, called by Mr. Conrad "the finger-post of the Eocene," proves to be the "finger-post" of the Tejon Group. Like its ally of the Eocene, it is peculiar to the formation, and its geographical limits are coextensive with the group.

At the time that I described it I had a pretty large series of specimens from near Fort Tejon, Martinez, and Clayton. Since then it has been found in several other localities, and fine specimens have been obtained near New Idria, and west of Griswold's, on the road from the latter place to San Juan. I had, however, no specimens of the true *planicosta* for comparison, and was obliged to depend partly on figures, partly on my memory, as I mentioned in the note to the description. That description should be slightly modified, so as to read—"Shell variable in shape, subtriangular to subquadrate," the subquadrate forms usually being the more adult, though some specimens, four and four and a half inches across, are as distinctly triangular as the typical *planicosta*. The number of the ribs is as constant as is usually the case in costate shells. I have before me one specimen with twenty-one, another with twenty-three ribs. I have compared my specimens with shells from the London Clay, and from the Alabama Eocene, and find that, except in the extreme quadrate forms, they are absolutely identical in all characters save one. The hinges are so similar that I despair of making an intelligible written description of their minute differences, and should hardly feel willing to trust an artist with their delineation. But a character exists by which the merest tyro could separate the two species. It is in the shape of the cross-section of the ribs. The surface is well represented by the figure in the first volume, and I have only to append a series of outline cross-sections to illustrate this difference. Fig. 83 is a magnified section of the ribs in their normal state; 83 *a*, is a section of these ribs after having been corroded by atmospheric or other causes; while 83 *b* is a section of the ribs of *C. planicosta*. It will be observed that even when the ribs of *C. Hornii* have been flattened by weathering, they are still different from the Eocene shell, in their slight elevation, and in the wide interspaces. Some old specimens of *C. Hornii* have the same peculiarity as some old specimens of *C. planicosta*, in the ribs becoming more flat, and even nearly obsolete towards the base. This is not a constant character in either species. One fine large shell of the latter form, from Claiborne, Ala., in the museum of the Philadelphia Academy, has the ribs as sharply defined at the base as towards the beaks.

CLISOCOLUS, *N. Gen.*

Pl. 30, Fig. 84.

SHELL thin, Lucinæform, without a lunule; ligament external, lodged in a deep groove; hinge edentate, having in the right

valve a slight thickening under the beak, and in the left valve an obsolete tubercle; pallial line unknown; internal margin entire.

I propose this genus on the shell described in the first volume of Pal. Cal., as *Loripes dubia*. The figures there given of the hinge are not good, the engraver not having faithfully followed my drawings. The tubercle in the left valve especially, is represented as too well-defined. The genus seems to be a member of the *Lucinidæ*, though from our ignorance of the shape of the mantle margin, the ultimate reference must yet remain an open question.

C. DUBIUS, Gabb.

(? *Loripes dubia*, Gabb; Pal. Cal., Vol. 1, p. 127, pl. 74, fig. 170, 171.)

Peculiar to the Chico Group.

LUCINA, Brug.

The references to the plates of *L. nasuta* and *L. postice-radiata*, in Vol. 1, were transposed, by mistake, in the text. They should read, *L. nasuta*, Pl. 24, Fig. 159, and *L. postice-radiata*, Pl. 24, Fig. 158. By reading the descriptions, the error becomes at once obvious.

CRASSATELLA, Lam.

C. GRANDIS, Gabb.

(*C. grandis*, Gabb; Pal. Cal., Vol. 1, p. 181, pl. 24, fig. 163.)

(*C. alta*, Con.; Pacific R. R. Report, Vol. 5, p. 321.)

(*C. alta*, Con.; Smithsonian Check List, Eocene, No. 104.)

(Not *C. alta*, Con.; Tert. Foss., p. 21, pl. 7.)

In my description of this species, I pointed out sufficiently the specific differences between the two forms. Another character, however, has since been discovered in the lunule, with which I was then unacquainted. In *C. alta* it is deeply impressed, the sides being vertical, the base flat, and the sides forming right angles both with the adjoining portion of the surface and with the floor of the depression. In *C. grandis* the lunule is equally deep and longer, but its margin is rounded, and the sides convergent, there being no flat space at the base.

C. COMPACTA, n. s.

Pl. 30, Fig. 85.

SHELL small, elongate subtrigonal, thick; beaks about a third of the length from the anterior end; cardinal margin sloping with a slight convexity to the posterior end, which is narrowly truncated; anterior end sloping, nearly straight above, broadly convex and prominent below; base nearly straight posteriorly, rounding upwards regularly in advance, and most prominent under the beaks; the lunule is almost entirely hidden in the matrix, but appears to be large and deeply impressed. Surface polished and marked by lines of growth in the middle, which develop into small ribs anteriorly; an angular ridge runs from the beaks to the posterior basal angle.

Length, .95 inch; width, .68 inch; height of single valve, .2 inch.

A single valve, from the Martinez Group, Martinez, given me by Mr. Mathewson.

This shell might be mistaken for the young of *C. grandis*, but it differs in being more elongate posteriorly, in the possession of the marked angular ridge, in the square posterior truncation, and in its greater convexity.

UNIO, Retz., Auct.*U. HUBBARDII*, n. s.

Pl. 30, Fig. 86.

SHELL moderately large, thick, obliquely subquadrate; beaks anterior, about a fourth of the length from the anterior end, somewhat prominent; posterior cardinal border straight (?) and slightly sloping (from lines of growth on the younger portions of the shell); anterior end regularly rounded and somewhat prominent; posterior end obliquely truncated; base nearly straight and sloping behind, most prominent under the beaks, and curving upwards regularly in advance; a strong angular ridge runs obliquely downwards and backwards from the beaks to the posterior basal angle. Surface marked by coarse, irregular lines of growth.

Length, 3. inches; width, 1.8 inch; thickness through both valves, 1 inch.

A single specimen, from the Nanaimo Coal Mine, Vancouver Island, Chico Group; kindly loaned me by Mr. Samuel Hubbard, of the Pacific Mail Steamship Company of San Francisco, and to whom I dedicate the species, in recognition of the unostentatious but valuable services he has been rendering to science for a series of years past.

MYTILUS, Linn.

M. QUADRATUS, n. s.

Pl. 31, Fig. 87.

(*Inoceramus Piochii* (pars), Gabb; Pal. Cal., Vol. 1, pl. 25, fig. 174.)

SHELL moderate in size, thin, flattened, elongate, rounded quadrate; beaks small, acute, terminal; anterior margin very slightly sinuous above, and broadly convex, nearly straight below; posterior side slightly convex and nearly parallel with the anterior; cardinal margin slightly sloping, and uniting by a broad curve with the posterior; base broadly convex, most prominent anteriorly. Surface slightly but regularly convex, except close to the anterior margin, where it falls more rapidly; ornamented by a few irregular lines of growth.

Figures, natural size.

From the Chico Group, at Martinez and Tuscan Springs.

In my original description of "*Inoceramus*" *Piochii*, I supposed this to be the smaller valve of that species, and accordingly included it. As will be seen further on, however, both valves of that shell are very different from the present one.

The present species can be at once distinguished from all other *Mytili* by its unusually square form. Its nearest ally is *M. ascia*, but that shell is arched, and the more slender form and acute anterior end will sufficiently separate them.

MODIOLA, Lam.

M. MAJOR, n. s.

Pl. 31, Fig. 88.

SHELL very large, thick, slightly curved; beaks small, about an eighth of the length from the anterior end, which is narrowly

rounded and produced; cardinal margin slightly arched; base concave in the middle, convex posteriorly; posterior end irregularly convex, most prominent below. Surface marked by coarse, irregular lines of growth.

Length, 4.8 inches; width, 2.4 inches; diameter about 1.5 inch.

Common in the white limestone of the Shasta Group, east of Knoxville, Lake County; also found smaller in the same beds in Morgan Valley, south of Clear Lake, and at the Hot Sulphur Springs, east of Clear Lake, Colusa County.

A fine species, well characterized by its size, being the largest species of the genus, with which I am acquainted. Some specimens are over six inches in length.

MELEAGRINA, Lam.

M. ANTIQUA, n. s.

Pl. 31, Fig. 89.

SHELL small, flattened, rounded quadrate; beaks acute, produced, and terminal; cardinal margin straight, very slightly sloping; anterior margin strongly sinuous for a short distance under the beaks, continued in a regular curve, running into the base, which is a little the most prominent posteriorly; posterior margin nearly straight, uniting with the base by a more abrupt curve than that on the anterior side. Surface plain, or marked only by lines of growth. Hinge slender; muscular scar large, broadly reniform, placed a very little posterior to the middle.

Length, 1.3 inch; width, 1.5 inch; thickness of two valves, .32 inch.

From Departure Bay, Nanaimo, Vancouver Island, associated with *Trigonia Evansana*, *Pecten Traskii*, and other fossils equally characteristic of the Chico Group.

The oldest known species of the genus, being from a deposit certainly older than the white chalk. It possesses all of the generic characters in a much more marked manner than we might feel warranted in expecting, when we consider how far removed the species is from the geological age in which the genus has obtained its greatest specific development. It is usually the case that, where a genus attains its greatest numerical specific development in any one geological age, those species which first appear, especially if in a remote formation, as well as those that mark

its gradual decline before its final disappearance, are the most apt to present variations from the normal type of the genus.

INOCERAMUS, Sby.

I. ELLIOTII, n. s.

Pl. 31, Fig. 90 *a*.

SHELL large, equivalve, subquadrate; beaks terminal; cardinal margin straight,(?) nearly as long as the shell; anterior end truncated, nearly straight; posterior end straight and sloping outwards above, rounded below, and, with the base, forming a nearly perfect semicircle. Surface marked by about a dozen large, sharp, concentric, imbricating ribs or lamellæ, with broad concave interspaces.

Figure, natural size; from a cast in sandstone: the accompanying outline section of the surface is restored from impressions in the matrix.

From the semi-metamorphosed Cretaceous sandstone on Alcatraz Island, San Francisco harbor. Presented to the survey cabinet by Major George H. Elliot, U. S. Engineers, by whom the first specimens were discovered. On subsequently visiting the locality, I found numerous casts of this and of several other bivalves, the latter in too imperfect a condition to be recognized. The species is of unusual interest, being the first incontestable proof discovered, of the Cretaceous age of the long-disputed "San Francisco Sandstone."

I. WHITNEYI, n. s.

Pl. 32, Fig. 91.

SHELL large, elongate, subelliptical; beaks large, prominent, anterior, subterminal; cardinal margin straight; anterior end and base broadly, regularly, and continuously rounded; posterior end forming a curve of longer radius, but also continuous with the base. Surface marked by about sixteen large concentric ribs, the basal margin being abruptly truncated at a nearly right angle with the remainder of the surface; details of surface ornament unknown.

Length, 3.3 inches; width, 2.8 inches; height of single valve, .8 inch

A single cast in a soft, gray, fine-grained sandstone, from near Folsom, and probably of the age of the Chico Group. Found by Professor Whitney. I have seen in this same matrix, *Ammonites Chicoensis*, *A. Sueciaensis*, *Baculites Chicoensis*, and casts of some undetermined Gasteropods.

AUCELLA, Keyserling.

A. PIOCHII, Gabb.

Pl. 32, Fig. 92, *a*, *b*, *c*.

(*Inoceramus Piochii*, Gabb; Pal. Cal., Vol. 1, p. 187, pl. 25, fig. 173 (*exclus. fig. 174*).)

This shell was originally described from two or three small specimens from near Mount Diablo; the Tuscan Springs specimens being the *Mytilus*, figured at 174, and which I have separated in the present paper. During the last three or four years, the species has been discovered in profusion in a large number of localities, and proves to be of great value in the identification of one of the members of the Shasta Group. Its specific characters may be defined as follows:

SHELL variable in outline, convex, variably inequivalve; symmetrical and obliquely ovate in the young state, when both valves have a small, narrow ear on the posterior side, which becomes obliterated as the shell grows larger. In the adult, large valve long, narrow, tapering, irregular in form; beak large, and strongly incurved, often overhanging the opposite valve. Smaller valve more or less triangular, anterior side usually somewhat truncated; beak small, acuminate and pointed in advance; posterior cardinal margin pretty regularly arched and sloping downwards rapidly; under the beak, on the anterior face, is a deep indented fold of the shell, forming an internal sinus (seen in figs. 92, and 92 *c*). Surface of both valves very variable in convexity, and in the adult, covered by irregular wrinkles, besides fine, and in some cases pretty regular, concentric ribs.

Figures, natural size, except 92 *c*, which is twice the size of the original.

Very characteristic of a series of shales of the Shasta Group, found from Mount Diablo, at various points along the east face of the Coast Range to the north end of the Sacramento Valley. Two or three good specimens from Washington Ter-

ritory, east of Puget Sound, were presented by Mr. Samuel Hubbard to the California Academy of Natural Sciences. In Colusa County, east of Clear Lake, I found this shell forming almost the entire bulk of some beds, interstratified with the white limestones. The Mount Diablo specimens are rare, and always small, while some from Colusa and Lake Counties are nearly three inches in greatest length. The only species that I have ever found associated in the same strata with the present one, is *Belemnites impressus*, which I have found at almost every locality of the *Aucella*, and which is also very characteristic of the most typical beds of the Shasta Group, in the vicinity of Cottonwood Creek.

PINNA, Linn.

P. BREWERII, Gabb.

Pl. 32, Fig. 93.

(*P. Brewerii*, Gabb; Pal. Cal., Vol. 1, p. 188, pl. 25, fig. 175.)

This is a rare species, and I have had the opportunity of examining but few specimens. A very fine one now before me, and for the loan of which I am indebted to the kindness of Mr. Voy, of Oakland, exhibits the specific characters better than any other yet discovered. The angle of divergence of the sides in this case, is nearer 40° than 20° . Near the middle of each valve is a strongly marked rib, on one side of which are six or seven fine, slightly elevated, radiating ribs; on the other side are two or three similar, obsolete radiations, and starting from the margin are some stronger, but irregular undulations, parallel with the midrib, which run downwards and curve inwards towards the middle; from the lines of growth, the base of the shell seems to have been notched in the middle.

The figure is natural size. Found only in the Chico Group; the present specimen being from Shasta County.

TRIGONIA, Brug.

T. ÆQUICOSTATA, n. s.

(*Indet.* ; Pal. Cal., Vol. 1, pl. 26, fig. 198.)

SHELL small, trigonal, elongate; beaks prominent, anterior; cardinal margin sloping posteriorly, straight to slightly convex or concave; anterior end regularly rounded; base broadly rounded, most prominent in the middle; posterior end narrowly truncated. Surface marked by regular, square, concentric ribs, with equal, flat, interspaces; these ribs end abruptly in advance, and are continued by fine lines starting with an angle somewhat less than a right angle; posteriorly there is an angular ridge running from the beak to the posterior basal angle, and on crossing this the ribs curve upwards towards the margin. Internally, the surface is marked by four or five radiating ribs under the beak; this character is not always present; the hinge teeth are unusually large, are coarsely ribbed, the anterior tooth being supported longitudinally by a vertical plate, starting from the upper edge of the muscular scar.

Figure in Vol. 1, natural size.

Common in the Chico Group at Orestimba Cañon, Curry's, south of Mount Diablo, Jacksonville, Oregon, and found occasionally at Martinez, and Cottonwood Creek.

AXINÆA, Poli.

A. SAGITTATA, Gabb.

(*A* (? *Limopsis*) *sagittata*, Gabb ; Pal. Cal., Vol. 1, p. 197, pl. 31, fig. 267.)

At the time that this species was described, I was unable to decide finally as to its generic relations. I have since been enabled to expose the area, which is very narrow but characteristic, and which places it in the above genus.

NUCULA, Lam.

N. (ACILA) TRUNCATA, Gabb.

(*Nucula truncata*, Gabb; Pal. Cal., Vol. 1, p. 198, pl. 26, fig. 184.)

A very common species, found at almost every locality of the Chico, Martinez, and Tejon Groups. The specific identity of these fossils having been denied, I have re-investigated the subject with the utmost care, and have failed to find even a varietal difference between specimens from the three deposits. At the same time, in the Martinez Group, at Martinez, in addition to the normal form, and associated with it, is a larger variety, of which I have three specimens. These I have compared, with the assistance of Mr. Conrad, both with the smaller variety of the Martinez Group, and with others from the adjoining deposits, and we can find no difference except the size.

N. SOLITARIA, n. s.

Pl. 32, Fig. 94.

SHELL small, rounded triangular; beaks small, rather prominent, subterminal, and inclined forwards; cardinal margin nearly straight, rapidly sloping posteriorly; anterior end subtruncated, a little excavated under the beaks, and very slightly convex below, united with the base by a pretty well-marked angle; base rounded, most prominent a little behind the middle; posterior end narrowly rounded. Surface marked by a few large and many minute lines of growth; hinge robust, pit small.

Length, .26 inch; width, .22 inch; height of single valve, .04 inch.

Very rare in the Chico Group, Texas Flat, Placer County.

With the general form of *N. (Acila) truncata*, this shell is very much smaller, and the entire absence of the radiating ornament will at once distinguish it. It is wider from beak to base in proportion to its length, the anterior end is much more convex, and the posterior is somewhat narrower.

LEDA, Schum.

L. GABBII, Con. sp.

(*L. protexta* ? Gabb; Pal. Cal., Vol. 1, p. 199, pl. 26, fig. 185.)

(Not *L. protexta*, Gabb; Jour. Phil. Acad., 2 Ser., Vol. 4, p. 303, pl. 48, fig. 23.)

(*Nuculana Gabbii*, Con.; Smithsonian Check List, No. 44.)

On comparing the Californian with the New Jersey species, I find that there are differences in form sufficient to warrant their separation. Mr. Conrad having proposed a new name for the Western shell, I am obliged to adopt it, though I should have preferred his choosing some other appellation. The present species is broader in proportion to its length, than the casts in the New Jersey marl, which, though all more or less imperfect, seem to have been remarkably long and straight.

PECTEN, Brug.

P. TRASKII, Gabb.

Pl. 32, Fig. 95.

(*Pecten Traskii*, Gabb; Pal. Cal., Vol. 1, p. 200, pl. 26, fig. 187.)

This rare shell was originally known by but two specimens from the loose-grained sandstones of Texas Flat, Placer County. A third has since been found by myself in the greenish rock on the north shore of Departure Bay, near Nanaimo, Vancouver Island, and which throws some additional light on the specific characters. The shell is very thin, and the surface, of which a fine fragment is preserved, has a slightly different ornament from the figure in the first volume. The lines in the interspaces between the ribs, which I mentioned at the time as being represented too numerous in the figure, are elevated threads, slightly irregular in their direction, and radiate from the middle. The figure above quoted represents their character near the side of the shell. The present figure represents the middle of the surface. The imbrication of the ribs is produced by these fine lines crossing them. So far as we know at present, the species is confined to the Chico Group.

P. MARTINEZENSIS, n. s.

Pl. 33, Fig. 96.

SHELL minute, thin, elongate, equivalve, equilateral; sides straight above, below forming with the base a regular curve. Lower valve, right auricle deeply emarginate, narrow; left smaller. Upper valve, right auricle small; left large, margin slightly sinuous. Surface ornamented by numerous fine radiating ribs.

Length from beak to base, .34 inch.

Not common in the Martinez Group, Martinez.

From the other *Pectens* of the California Cretaceous, this species can be distinguished by its small size and radiating ribs. I was formerly inclined to believe

it to be the young of *P. Traskii*, but have now three specimens varying only in size one or two-hundredths of an inch, and consequently cannot resist the belief that it is a distinct species.

P. COMPLEXICOSTA, n. s.

Pl. 33, Fig. 97, 97 a.

SHELL moderate in size, thin, equivalve, nearly equilateral; sides and base forming a regular curve, slightly elongated; the right side of the upper valve, and corresponding side of the lower, a little the most convex above; upper valve with the left ear a little concave on its lateral margin; shape of the right ear unknown; right ear of lower valve narrow, produced, and deeply emarginate. Surface marked by about twelve or fourteen radiating ribs, with sometimes an equal number of smaller ones intercalated; these are more strongly marked on the cast than externally; besides the ribs, the entire surface is closely sculptured by minute radiating lines, very variable in size.

Figure, natural size, and a magnified view of the surface.

Common in the white limestone of the Shasta Group in Morgan Valley, south of Clear Lake, collected by Professor Whitney. Although the species is abundantly represented at this locality, no entire specimens have ever been obtained, owing to the character of the matrix. By the study of a large number of fragments, I have been enabled to arrive at all the important specific characters, except the shape of the ear, which is represented broken in the figure, as it occurs in the best specimen. Two or three casts before me give the outline, and the details of the surface are drawn from impressions in the matrix.

P. INTERRADIATUS, n. s.

Pl. 33, Fig. 98, 98 a.

SHELL small, subcircular, equivalve, equilateral, compressed, thin; upper valve, ears equal, moderately large; lower valve, right ear long, deeply and narrowly emarginate. Surface marked by very numerous fine radiating lines, and obscure lines of growth. Internal surface of both valves bearing eight straight, equidistant, large ribs, of variable length among themselves, extending

from the beaks to near the middle of the shell, and ending abruptly.

Figures, natural size.

From a buff-colored shale east of New Idria, at or very near the summit of the Tejon Group, where I found it very abundant.

P. operculiformis and *P. Californicus* of the California Cretaceous are marked by concentric lines only; the former is much larger than the present species, and the ears are of a very different shape; neither of those species has the internal ribs of this shell. The other species are longer, with smaller ears, and are markedly costate.

NEITHEA, Drouet.

N. GRANDICOSTA, n. s.

Pl. 33, Fig. 99 a.

SHELL minute, very inequivalve, equilateral, elongated; lower valve, sides tapering a little concavely; general contour of the base semicircular, with six prominent angles and concave interspaces. Surface marked by six very large, round, equidistant ribs, the interspaces carrying a small rib, flanked on each side by one still smaller; in some cases the sides of the large ribs are faintly striate; crossing these ribs are minute, very regular lines of growth; ears very unequal, the right ear long and deeply emarginate.

Length from beak to base, .5 inch.

Rare in the Shasta Group, Cottonwood Creek, Shasta County.

This is one of the smallest, if not absolutely the smallest species yet described in the genus. It has some resemblance to *N. duplicicosta*, Roem. sp., of Texas, which has three intermediate ribs; but in that shell the large rib is very compound. It is most nearly allied to the French Neocomien species, *N. atava*, d'Orb. sp., but the ears are of a different shape; in that shell the right ear of the lower valve is much smaller, the interspaces are more concave, and the large ribs, instead of being simple, are made up of three smaller ribs.

LIMA, Brug.

L. SHASTAENSIS, n. s.

Pl. 33, Fig. 100.

SHELL small, compressed, irregularly subelliptical, equivalve; anterior side and base forming a regular curve, the posterior margin of the base rounding up rather abruptly to the posterior side, which is straight; ears very small, the anterior triangular, the posterior narrow, almost linear; posterior umbonal slope very narrow. Surface ornamented by twenty or twenty-one prominent, straight, radiating ribs, with the interspaces of equal size.

Greatest length, from beak to base, .6 inch; antero-posterior diameter, .45 inch; depth of single valve, .09 inch.

Rare in the Shasta Group, Cottonwood Creek, Shasta County.

I have two specimens of this shell, one of which is somewhat mutilated, but they fortunately show both valves. The species is less oblique than *L. microtis*, and the ornament of the surface is entirely different, as it is also from *L. appressa*. The latter species is narrower above than the present one, it is a straighter shell, and the anterior ear is larger.

L. MULTIRADIATA, n. s.

Pl. 33, Fig. 101.

There is but a single mutilated specimen of this fine shell in the collection, with its corresponding impression in the matrix. The lines of growth on the latter, together with some, less distinct, on the shell itself, supply the outline, except of a small portion of the posterior margin, and of the ear on that side. The specific characters, so far as shown, are as follows:

SHELL (right valve) large, oblique, compressed subelliptical; anterior side forming a regular curve to the middle of the base, very slightly sinuous above, under the ear; posterior portion of the basal margin much more narrowly rounded than in advance, uniting by a broad curve above, with the posterior side, the upper half of which seems to have been nearly straight; the anterior ear seems to have been long and narrow. Surface convex a little

behind the middle, the anterior slope being broad and nearly flat; the entire surface covered by very numerous, slightly wavy, somewhat irregular, radiating ribs of small size, and with narrow interspaces; on the younger portion of the shell, the spaces between the ribs are mere impressed lines, the ribs being convex; near the base, however, the ribs become proportionally smaller, the spaces are wider than the ribs, and are concave, and the whole are crossed by minute subsquamose lines of growth.

Length from beak to base, of a broken specimen, 3 inches.

From the vicinity of Lower Lake Village, Lake County; from a deposit intermediate between the Martinez and Tejon Groups.

This shell belongs to the type of Sowerby's *Plagiostoma*, a group of extinct species, well characterized by their peculiar surface ornament. I am familiar with the external characters of a number of the species, but have never had the good fortune of being able to examine the hinge.

The present species is closely allied to *L. microtis*, nobis, but is proportionally much broader, the posterior side is straighter, the anterior side is much more regularly curved, being most prominent in the middle or below, while in *microtis* the greatest prominence is just below the ear; the most marked difference seems to be in the relative degree of obliquity of the two species. Another difference is in the surface ornament; both have numerous, small ribs, but *microtis* has the interspaces punctate and the ribs flat, while the present shell has round ribs, and the grooves are perfectly simple, except for the lines of growth.

ANOMIA, Linn.

A. VANCOUVERENSIS, n. s.

Pl. 33, Fig. 102.

SHELL circular, thin; upper valve unknown; lower valve flat; marked by strong lines of growth and by very faint radiating lines; aperture elongated, oblique, occupying nearly a third of the diameter of the shell.

Diameter, 1. inch.

From the Chico Group, Departure Bay, near Nanaimo, Vancouver Island.

It is not impossible that this may prove to be the under valve of *A. lineata*, nob. (Vol. 1, p. 203, pl. 26, fig. 193), which belongs to the same group in the formation, and of which the lower valve was unknown.

OSTREA, Linn.

O. IDRIAENSIS, n. s.

Pl. 33, Fig. 103, *b*, *c*, *d*.Pl. 34, Fig. 103, 103 *a*.

SHELL moderately large, oblique, often curved, heavy; lower valve usually deep, more oblique than the upper; hinge straight or deflected to the left, median groove pretty strongly marked; internal margins in the young shell, finely crenulated or pitted towards the beak, this character disappearing to a great extent in the adult. Surface of both valves roughly and very irregularly squamose. Muscular scar reniform to semicircular, and placed distinctly to one side of the middle.

Length, from three to six inches. The figures are all natural size, the greatest thickness of the specimen, fig. 103, is 1.25 inch, the fragment, 103 *a*, has about an equal thickness, indicating a shell when entire, perhaps three inches through both valves.

From the Tejon Group, on the same horizon as the beds at Marsh's, near Mount Diablo. Locality, about two miles east of the Hacienda at New Idria, where it is very abundant.

The obliquity of the hinge in this shell is quite a variable character. It is well represented by the figures 103 and 103 *d*, in its greatest extent; figure 103 *a* is a transition form, while a specimen of an upper valve before me, has the hinge nearly straight.

O. APPRESSA, n. s.

Pl. 34, Fig. 104, 104 *a*.

SHELL thin, flat, more or less equilateral, valves nearly equal, usually about two-fifths longer than wide. Surface covered by numerous, thin, squamose plates. Hinge flat, large; margins simple, sometimes subsquamose. Muscular scar small, oblique.

Figures, natural size. Some specimens were found seven inches long.

I found this shell forming a stratum several feet thick, adjoining a bed of coal, and in associated strata were familiar species characteristic of the Tejon Group.

The locality is on one of the branches of Eel River, at the mouth of Salt Creek, southwest of Round Valley, Mendocino County

The species is remarkable for its thin, flat shell, often distorted, and for its broad, flat hinge.

BRACHIOPODA.

RHYNCHONELLA, Fisch.

R. WHITNEYI, Gabb.

Pl. 34, Fig. 105, *a, b*.

(*Terebratella Whitneyi*, Gabb; Pal. Cal., Vol. 2, p. 35, pl. 12, fig. 62, 62 *a*.)
(Compare *R. peregrina*, Von Buch sp., d'Orb.; Pal., Fr. Terr. Cret., Vol. 4, p. 16, pl. 193.)

When this species was described, it was supposed to be Tertiary, and the description and figures were taken from immature specimens. In the latter part of 1866 I had an opportunity of studying the rocks from which it came, and found them interstratified with shales containing *Aucella Piochii* and *Belemnites impressus*, thereby proving them to belong to the Shasta Group. The species is extremely abundant in the white limestones of Lake and Colusa Counties, and I was fortunate in procuring the large specimen now figured. The species is very closely allied to *R. peregrina* of the French Neocomien, and it is not impossible that they may yet prove identical. I shall, however, retain the specific name for the present, until the question of their identity can be definitely settled pro or con. The following points of difference exist between the specimen before me, and a fine example of the French shell in the Museum of the Philadelphia Academy. While the number and shape of the ribs are the same in both specimens, the Californian shell is very much more convex, the beak is higher, and the deltidium is markedly narrower; in *R. peregrina*, all of the ribs which reach the lateral margins cause a strong zigzag serration of the margin when viewed directly; in the present shell, this effect is produced only below the middle, on account of the upper ribs becoming less distinct as they approach the edge.

Very numerous specimens of another *Brachiopod* have been found by Mr. Mathewson at Martinez, in a sandstone, probably of the Chico Group. The valves are always separated, and I have never succeeded in discovering a single generic character. The shell is very transverse, a third wider than long, and is closely covered by minute radiating ribs to beyond the middle, where, reversing the usual order, instead of branching they unite by twos or threes, forming a few large angular folds on the lateral and basal margins. One valve appears to have a broad

shallow sinus at the middle of its base, bearing three or four of these folds; a corresponding tongue or prolongation of the other valve meeting it, but without the usual median depression on the surface. Among between twenty-five and thirty specimens, not one shows all the surface of a valve, though by counting several, it seems that there are nearly sixty of the small ribs and about fifteen of the large marginal folds.

RADIATA.

SMILOTROCHUS, E. & H.

? S. CURTUS, n. s.

Pl. 34, Fig. 106, 106 a.

Polypidom circular, low, base apparently rounded or very blunt, sides but slightly diverging. Internal septa short, numerous, leaving a well-marked cup-like cavity in the middle; their sides marked by numerous small, curved, raised lines, radiating from below upwards and inwards. External surface unknown.

Figures, natural size.

Rare near Martinez. Two specimens in my collection from either the Martinez or Chico Groups; found by Mr. Mathewson. This coral is easily distinguished by its short, robust, cup-like form. The surface sculpture is lost on both the specimens, being torn away by the hard matrix in which they were embedded.

PALÆONTOLOGY OF CALIFORNIA.

VOL. II.

SECTION II.

CRETACEOUS FOSSILS.

PART II.

SYNOPSIS OF THE CRETACEOUS INVERTEBRATE
FOSSILS OF CALIFORNIA.

CRUSTACEA.

CALLIANASSA, Leach. **C. STIMPSONII**, Gabb.

C. Stimpsonii, Gabb; Pal. Cal., Vol. 1, p. 57, pl. 9, fig. 1, *a*, *b*, *c*.

Id., Gabb; Vol. 2, p. 127, pl. 19, fig. 3.

Chico Group, Chico Creek; Tejon Group, Clayton and Tejon.

GEN? **SP. INDET.**

A carapace from the Martinez (?) Group, Martinez.

GEN? **SP. INDET.**

Hands of a *Macrouran*, from the Shasta Group, Cottonwood Creek, Shasta County.

MOLLUSCA.

CEPHALOPODA.

PTILOTEUTHIS, Gabb. **P. FOLIATUS**, Gabb.

Ptiloteuthis foliatus, Gabb; Pal. Cal., Vol. 2, p. 128, pl. 19, fig. 4.

Shasta Group, Cottonwood Creek.

BELEMNITES, Cuv. **B. IMPRESSUS**, Gabb.

B. impressus, Gabb; Vol. 1, p. 58, pl. 9, fig. 2.

Shasta Group, Cottonwood Creek, Horsetown, Mount Diablo, Colusa County.

NAUTILUS, Brug. **N. TEXANUS**,? Shum.

N. Texanus, Shum.; Trans. St. Louis Acad., 1860, p. 590.

Id., Gabb; Pal. Cal., Vol. 1, p. 59, pl. 9, fig. 3.

? Shasta Group, Cottonwood Creek, Alderson's Gulch, Mount Diablo.

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N. CAMPBELLI, Meek.

N. Campbelli, Meek; Proc. Phil. Acad., 1861, p. 318.

Comax, Vancouver Island.

ATURIA, Bronn. A. MATHEWSONII, Gabb.

A. Mathewsonii, Gabb; Vol. 1, p. 59, pl. 17, fig. 31.

Martinez Group, Martinez; Tejon Group, Clayton and Tejon.

AMMONITES, Brug. A. BREWERII, Gabb.

A. Brewerii, Gabb; Vol. 1, p. 62, pl. 10, fig. 7.

Id., Gabb; Vol. 2, p. 130, pl. 20, fig. 5; pl. 19, fig. 5 *a*, *b*, 6 *a*.

A. Neuberryanus, Gabb, part. (not Meek); Vol. 1, pl. 10, fig. 6.

Shasta Group, Cottonwood Creek.

A. HAYDENII, Gabb.

A. Haydenii, Gabb; Vol. 1, p. 62, pl. 10, fig. 8.

With the preceding.

A. PERUVIANUS,? Von Buch.

A. Peruvianus, Von Buch; Petrif. Rec. par Humboldt en Amer., p. 5, pl. 1, fig. 5-7.

A. Peruvianus ? Gabb; Vol. 1, p. 63, pl. 10, fig. 9.

Id., Marcou; Geol. North Amer., pl. 5, fig. 1.

From Von Buch's original figure and description, it seems doubtful if his shell is really an Ammonite, but my single fragment is too imperfect to permit more than a very doubtful determination.

Chico Group, Tuscan Springs.

A. TRASKII, Gabb.

A. Traskii, Gabb; Vol. 1, p. 63, pl. 11, fig. 10; pl. 12, fig. 11.

Id., Gabb; Vol. 2, p. 131, pl. 19, fig. 7, 7 *a*, 7 *b*.

Shasta Group, Cottonwood Creek, and Arbuckle's Diggings, Shasta County.

A. RAMOSUS, Meek.

A. (Scaphites) ramosus, Meek; Trans. Albany Inst., Vol. 4, p. 45.

A. ramosus, Gabb; Pal. Cal., Vol. 1, p. 65, pl. 11, fig. 12, 12 *a*; pl. 12, fig. 12 *b*.

Shasta Group, Cottonwood Creek.

A. HOFFMANNII, Gabb.

A. Hoffmannii, Gabb; Vol. 1, p. 65, pl. 11, fig. 13, 13 *a*; pl. 12, fig. 13 *b*.

Id., Vol. 2, p. 131, pl. 20, fig. 8, 8 *a*.

Shasta Group, Horsetown, and Cottonwood Creek.

A. RÉMONDII, Gabb.

A. Rémondii, Gabb; Vol. 1, p. 66, pl. 12, fig. 14, 14 *a*, 15.

Shasta Group, Cottonwood Creek; Chico Group, Pence's.

A. BATESII, Trask.

A. Batesii, Trask; Proc. Cal. Acad., 1855, Vol. 1, p. 40.

A. Batesii, Gabb; Vol. 1, p. 67, pl. 13, fig. 16, 16 *a*.

A. Batesii, Gabb; Vol. 2, p. 132, pl. 20, fig. 9, 9 *a*; pl. 21, fig. 10, *a*, *b*.

Shasta Group, Cottonwood Creek, Chico Group, Benicia, and south of Mount Diablo.

A. TEHAMAENSIS, Gabb.

A. subtricarinatus, Gabb (not d'Orb.); Vol. 1, p. 60, pl. 10, fig. 4.

A. Tehamaensis, Gabb; Vol. 2, p. 132.

Shasta Group (?), Battle Creek, Tehama County.

A. CHICOENSIS, Trask.

A. Chicoensis, Trask; Proc. Cal. Acad., Vol. 1, p. 85, pl. 2, fig. 1.

Id., Gabb; Vol. 1, p. 68, pl. 13, fig. 17, 17 *a*, 17 *b*.

Chico Group, Chico Creek, Pence's, Kelly's, Siskiyou Mountains, San Luis Gonzaga, Cottonwood Creek.

A. SUCIAENSIS, Meek.

A. complexus var. *Suciaensis*, Meek; Proc. Phil. Acad., 1861, p. 317.

A. complexus ? Gabb; Vol. 1, p. 69.

A. Suciaensis, Gabb; Vol. 2, p. 133, pl. 21, fig. 11, *a*, *b*.

Chico Group, Folsom, near Mount Diablo, and Sucia Island, in the Gulf of Georgia.

A. VANCOUVERENSIS, Meek.

A. Vancouverensis, Meek; Proc. Phil. Acad., 1861, p. 317.

Comax, Vancouver Island.

A. JUGALIS, Gabb.

A. jugalis, Gabb; Vol. 2, p. 133, pl. 22, fig. 12, *a*, *b*, 13 *a*.

A. Newberryanus, Gabb (not Meek); *pars*, Vol. 1, pl. 10, fig. 5; fig. 6 *b*.

Martinez Group, Martinez, Benicia, Curry's, south of Mount Diablo; Tejon Group, Martinez, and Clayton.

A. NEWBERRYANUS, Meek.

A. Newberryanus, Meek; Trans. Alb. Inst., Vol. 4, p. 47.

Id., Gabb, *pars*, Vol. 1, p. 61, pl. 27, fig. 199, *a*, *b*, *c*.

Chico Group, Vancouver Island.

A. WHITNEYI, Gabb.

A. Whitneyi, Gabb; Vol. 2, p. 134, pl. 22, fig. 14, *a*, *b*.

Shasta Group, Cottonwood Creek.

A. STOLICZKANUS, Gabb.

A. Stoliczkanus, Gabb; Vol. 2, p. 135, pl. 23, fig. 16, 16 *a*.

Shasta Group, Cottonwood Creek.

A. FRATERNUS, Gabb.

A. fraternus, Gabb; Vol. 2, p. 137, pl. 23, fig. 15, *a*, *b*.

Martinez Group, Benicia.

? A. COOPERII, Gabb.

? *A. Cooperii*, Gabb; Vol. 1, p. 69, pl. 14, fig. 23, 23 *a*.

Chico Group, ? San Diego.

HAMITES, Park. H. (? ANCYLOCERAS) VANCOUVERENSIS, Gabb.

Hamites Vancouverensis, Gabb; Vol. 1, p. 70, pl. 13, fig. 18.

Chico Group, Vancouver Island.

HELIOCERAS, d'Orb. ? H. VERMICULARIS, Gabb.

? *H. vermicularis*, Gabb; Vol. 1, p. 71, pl. 13, fig. 19, 19 *a*.

Martinez Group, near Martinez.

H. BREWERII, Gabb.

H. Brewerii, Gabb; Vol. 1, p. 72, pl. 14, fig. 22.

Chico Group, Pence's.

H. DECLIVE, Gabb.

H. declive, Gabb; Vol. 1, p. 73, pl. 28, fig. 200, 200 *a*.

Chico Group, Pence's Ranch.

TURRILITES, Lam. **T. OREGONENSIS**, Gabb.

T. sp. indet., Gabb; Vol. 1, p. 73, pl. 20, fig. 201.

T. Oregonensis, Gabb; Vol. 2, p. 138.

Chico Group, Jacksonville, Oregon, and Crooked Creek of the Des Chutes,
east of the Cascade Range.

ANCYLOCERAS, d'Orb. **A. RÉMONDII**, Gabb.

Crioceras (*A. ?*) *Rémondii*, Gabb; Vol. 1, p. 75, pl. 14, fig. 24 *a*.

Ancyloceras sp. ? Gabb; Vol. 1, p. 78, pl. 15, fig. 30.

A. Rémondii, Gabb; Vol. 2, p. 138, pl. 23, fig. 17.

Shasta Group, Cottonwood Creek, Arbuckle's.

A. PERCOSTATUS, Gabb.

Crioceras percostatus, Gabb; Vol. 1, p. 77, pl. 16, fig. 26; pl. 17, fig. 26 *a*.

A. percostatus, Gabb; Vol. 2, p. 138, pl. 24, fig. 19.

Shasta Group, Cottonwood Creek, Arbuckle's, and a fragment (of this species
?) from the vicinity of Martinez.

? A. QUADRATUS, Gabb.

Ptychoceras (*? Hamites*) *quadratus*, Gabb; Vol. 1, p. 74, pl. 15, fig. 21; pl. 14,
fig. 21 *a*.

Chico Group, Pence's Ranch.

? A. LINEATUS, Gabb.

? A. lineatus, Gabb; Vol. 2, p. 139, pl. 23, fig. 18, *a*, *b*, *c*.

Shasta (?) or Chico Group, Cottonwood Creek, and Chico Group near Folsom.

CRIOCERAS, d'Orb. **C. LATUS**, Gabb.

C. latus, Gabb; Vol. 1, p. 76, pl. 15, fig. 25 25 *a*; pl. 14, fig. 25 *b*.

Shasta Group, near Weaverville.

HELICANCYLUS, Gabb. *H. æQUICOSTATUS*, Gabb.

Ptychoceras æquicostatus, Gabb; Vol. 1, p. 74, pl. 13, fig. 20.

H. æquicostatus, Gabb; Vol. 2, p. 141, pl. 25, fig. 20, *a-g*.

Shasta Group, Cottonwood Creek, Alderson's Gulch, and Eagle Creek, Shasta County.

DIPTYCHOCERAS, Gabb. *D. LÆVIS*, Gabb.

D. lævis, Gabb; Vol. 2, p. 144, pl. 25, fig. 21, *a, b*.

Shasta Group, Cottonwood Creek.

BACULITES, Lam. *B. CHICOENSIS*, Trask.

B. Chicoensis, Trask; Proc. Cal. Acad., 1856, p. 85, pl. 2, fig. 2.

B. Chicoensis, Gabb; Vol. 1, p. 80, pl. 17, fig. 27, 27 *a*; pl. 14, fig. 27 *b*, 29, 29 *a*.

Chico Group, Chico, Pence's, Cottonwood, Orestimba, and San Diego; Martinez Group, Martinez.

B. OCCIDENTALIS, Meek.

B. ovatus, ? Meek; Tr. Alb. Inst., Vol. 4, p. 48.

B. occidentalis, Meek; *loc. cit.*, p. 49.

Id., Meek; Proc. Phil. Acad., 1861, p. 316.

B. sp. indet., Gabb; Vol. 1, p. 81, pl. 14, fig. 28 *b*; pl. 17, fig. 28, 28 *a*.

Chico Group, Vancouver Island.

B. INORNATUS, Meek.

B. inornatus, Meek; Proc. Phil. Acad., 1861, p. 316.

Sucia Island, Gulf of Georgia.

GASTEROPODA.**TYPHIS**, Montf. *T. ANTIQUUS*, Gabb.

T. antiquus, Gabb; Vol. 1, p. 82, pl. 18, fig. 31.

Tejon Group, Martinez, Tejon.

FUSUS, Lam. *F. MARTINEZ*, Gabb.

F. Martinez, Gabb; Vol. 1, p. 82, pl. 18, fig. 32.

Tejon Group, Martinez, Tejon.

F. MATHEWSONII, Gabb.

F. Mathewsonii, Gabb; Vol. 1, p. 83, pl. 18, fig. 33.

Martinez Group, Martinez and Curry's; Tejon Group, Martinez, Clayton and Cochrane's.

F. AVERILLII, Gabb.

F. Averillii, Gabb; Vol. 1, p. 83, pl. 18, fig. 34.

Chico Group, Tuscan Springs.

F. DIABOLI, Gabb.

F. Diaboli, Gabb; Vol. 1, p. 84, pl. 18, fig. 35.

Tejon Group, vicinity of Mount Diablo, Tejon.

F. ARATUS, Gabb.

F. aratus, Gabb; Vol. 1, p. 84, pl. 28, fig. 202.

Group? (Martinez or Chico) Martinez.

F. FLEXUOSUS, Gabb.

F. flexuosus, Gabb; Vol. 1, p. 85, pl. 21, fig. 109.

Martinez Group, Martinez.

F. KINGII, Gabb.

F. Kingii, Gabb; Vol. 1, p. 85, pl. 28, fig. 204.

Chico Group, Cottonwood Creek, Siskiyou County (not the creek of the same name in Shasta County).

F. CALIFORNICUS, Con., sp.

F. Californicus, Gabb; Vol. 1, p. 85, pl. 28, fig. 205 a.

? *Clavatula Californica*, Con.; P. R. R. Report, Vol. 5, p. 322, pl. 2, fig. 11.

Tejon Group, Clayton, Tejon; beds intermediate between the Tejon and Martinez Groups, Lower Lake Village, Lake County.

F. TUMIDUS, Gabb.

F. tumidus, Gabb; Vol. 2, p. 145, pl. 26, fig. 22.

Martinez Group, Martinez.

F. OCCIDENTALIS, Gabb.

F. occidentalis, Gabb; Vol. 2, p. 146, pl. 26, fig. 23.

Martinez Group, Martinez.

NEPTUNEA, Bolt. N. (TRITONOFUSUS) CRETACEA, Gabb.

Neptunea (Tritonofusus) cretacea, Gabb; Vol. 2, p. 146, pl. 26, fig. 24.
Tejon Group, Martinez.

N. MUCRONATA, Gabb.

N. mucronata, Gabb; Vol. 2, p. 147, pl. 26, fig. 25.
Martinez Group, Martinez.

? N. SUPRAPLICATA, Gabb.

? *N. supraplicata*, Gabb; Vol. 1, p. 89, pl. 18, fig. 40.
Tejon Group, Clayton, and San Diego.

? N. GRACILIS, Gabb.

N. gracilis, Gabb; Vol. 1, p. 90, pl. 18, fig. 42.

N. CURVIROSTRIS, Gabb.

N. curvirostris, Gabb, Vol. 1, p. 88, pl. 18, fig. 37.
Chico Group, Cow Creek.

PALÆATRACTUS, Gabb. P. CRASSUS, Gabb.

P. crassus, Gabb; Vol. 2, p. 148, pl. 26, fig. 26.
Shasta(?) Group, Colusa County, near Sulphur Springs.

ERIPACHYA, Gabb. E. PONDEROSA, Gabb.

Neptunea ponderosa, Gabb; Vol. 1, p. 88, pl. 18, fig. 38.
Eripachya ponderosa, Gabb; Vol. 2, p. 149.
Chico Group, Tuscan Springs, Pence's.

E. PERFORATA, Gabb.

Neptunea perforata, Gabb; Vol. 1, p. 89, pl. 13, fig. 39.
Eripachya perforata, Gabb; Vol. 2, p. 149.
Shasta Group, Cottonwood Creek.

E. HOFFMANNII, Gabb.

Neptunea Hoffmannii, Gabb; Vol. 1, p. 90, pl. 18, fig. 41.
Eripachya Hoffmannii, Gabb; Vol. 2, p. 149.
Shasta Group, Cottonwood Creek.

PERISSOLAX, Gabb. **P. BREVIROSTRIS**, Gabb.

P. brevirostris, Gabb; Vol. 1, p. 91, pl. 19, fig. 43.

Chico Group, Tuscan Springs, Pence's Ranch; Martinez Group, Martinez;
beds intermediate between Martinez and Tejon Group, Lower Lake Village,
Lake County.

P. BLAKEI, Con., sp.

Busycon ? Blakei, Con.; Pacific R. R. Rep., Vol. 5, p. 322, pl. 2, fig. 13.

Lævifusus Blakei, Con.; Smithsonian Check List.

Perissolax Blakei, Gabb; Vol. 1, p. 92, pl. 21, fig. 110.

Id., Gabb; vol. 2, p. 149.

Tejon Group, Martinez, Clayton, Cochrane's, and Tejon.

SURCULA, H. & A. Ad. **S. PRÆATTENUATA**, Gabb.

S. præattenuata, Gabb; Vol. 2, p. 150, pl. 26, fig. 27.

Tejon Group, San Diego.

S. (SURCULITES) SINUATA, Gabb.

Conus sinuatus, Gabb; Vol. 1, p. 123, pl. 29, fig. 227.

Surcula (Surculites) sinuata, Gabb; Vol. 2, p. 150, pl. 26, fig. 28.

Tejon Group, Tejon.

S. (SURCULITES) INCONSPICUA, Gabb.

S. (S.) inconspicua, Gabb; Vol. 2, p. 151, pl. 26, fig. 29.

Martinez Group, Martinez.

S. CLAYTONENSIS, Gabb.

Turris Claytonensis, Gabb; Vol. 1, p. 92, pl. 18, fig. 46.

Tejon Group, Clayton, Tejon.

S. RARICOSTATA, Gabb.

Turris raricostata, Gabb; Vol. 1, p. 93, pl. 18, fig. 47.

(*varicostata*, typographical error.)

Surcula id., Con.; Sm. Check List, Eocene, No. 588.

Tejon Group, Clayton.

HETEROTERMA, Gabb. **H. TROCHOIDEA**, Gabb.

H. trochoidea, Gabb; Vol. 2, p. 152, pl. 26, fig. 30, 30 a.

Martinez Group, Martinez.

BELA, Leach. **B. CLATHRATA**, Gabb.

Bela clathrata, Gabb; Vol. 2, p. 152, pl. 26, fig. 31.

Tejon Group, Martinez.

CORDIERA, Rouault. **C. MICROPTYGMA**, Gabb.

C. microptygma, Gabb; Vol. 1, p. 93, pl. 28, fig. 203.

Tejon Group, Tejon.

C. MITRÆFORMIS, Gabb.

C. mitræformis, Gabb; Vol. 2, p. 153, pl. 26, fig. 32.

Shasta Group, Colusa County, near the Sulphur Springs.

TRITONIUM, Link. **T. HORNII**, Gabb.

Tritonium Hornii, Gabb; Vol. 1, p. 94, pl. 28, fig. 208.

Tejon Group, Tejon and Cochrane's, near Mount Diablo.

T. PAUCIVARICATUM, Gabb.

T. paucivaricatum, Gabb; Vol. 1, p. 95, pl. 28, fig. 209 a.

Tejon Group, Tejon.

T. WHITNEYI, Gabb.

T. Whitneyi, Gabb; Vol. 1, p. 96, pl. 28, fig. 210 a.

Tejon Group, Tejon, San Diego.

T. CALIFORNICUM, Gabb.

Tritonium Californicum, Gabb; Vol. 2, p. 154, pl. 26, fig. 33.

Tejon Group, Tejon.

TRITONIUM, (*S. Gen.* **TRACHYTRITON**, Meek). **T. (T.) DIEGOENSIS**, Gabb.

Tritonium Diegoensis, Gabb; Vol. 1, p. 95, pl. 18, fig. 44.

Tejon Group, San Diego.

T. (T.) TEJONENSIS, Gabb.

T. (T.) Tejonensis, Gabb; Vol. 2, p. 154, pl. 26, fig. 34.

Tejon Group, Tejon.

T. (T.) FUSIFORME, Gabb.

T. (T.) fusiforme, Gabb; Vol. 2, p. 155.

Figure without name or description, Vol. 1, pl. 18, fig. 45.

Tejon Group, Tejon.

BRACHYSPHINGUS, Gabb. **B. LIRATUS**, Gabb.

Buccinum liratum, Gabb; Vol. 1, p. 96, pl. 28, fig. 211.

Brachysphingus liratus, Gabb; Vol. 2, p. 156.

Tejon Group, Martinez, Clayton, Marsh's.

B. SINUATUS, Gabb.

B. sinuatus, Gabb; Vol. 2, p. 156, pl. 26, fig. 35.

Tejon Group, Martinez.

BULLIA, Gray. (*S. Gen.* **MOLOPOPHORUS**, Gabb.) **B. (M.) STRIATA**, Gabb.

B. (M.) striata, Gabb; Vol. 2, p. 157, pl. 26, fig. 36.

Tejon Group, Tejon.

NASSA, Lam. **N. CRETACEA**, Gabb.

N. cretacea, Gabb; Vol. 1, p. 97, pl. 18, fig. 49.

Tejon Group, Martinez, Tejon, and ten miles west of Griswold's.

N. ANTIQUATA, Gabb.

N. antiquata, Gabb; Vol. 1, p. 97, pl. 18, fig. 50.

Tejon Group, Martinez.

HAYDENIA, Gabb. **H. IMPRESSA**, Gabb.

Haydenia impressa, Gabb; Vol. 1, p. 98, pl. 18, fig. 51.

Chico Group, Tuscan Springs, and Pence's.

PSEUDOLIVA, Swains. **P. LINEATA**, Gabb.

P. lineata, Gabb; Vol. 1, p. 99, pl. 18, fig. 52.

Tejon Group, Martinez.

P. VOLUTÆFORMIS, Gabb.

P. volutæformis, Gabb; Vol. 1, p. 99, pl. 28, fig. 212.
Tejon Group, Tejon.

OLIVELLA, Swains. **O. MATHEWSONII**, Gabb.

O. Mathewsonii, Gabb; Vol. 1, p. 100, pl. 18, fig. 53.
Tejon Group, Martinez, Tejon, Clayton, and Griswold's.

ANCILLARIA, Lam. **A. ELONGATA**, Gabb.

A. elongata, Gabb; Vol. 1, p. 100, pl. 18, fig. 54.
Tejon Group, Clayton, Cochrane's, and San Diego.

FASCIOLARIA, Lam. ? **F. LÆVIUSCULA**, Gabb.

? *F. læviuscula*, Gabb; Vol. 1, p. 100, pl. 18, fig. 55.
Beds intermediate between the Martinez and Tejon Groups at Clayton, and
near Lower Lake Village.

F. SINUATA, Gabb.

F. sinuata, Gabb; Vol. 1, p. 101, pl. 28, fig. 213 *a*.
Tejon Group, Tejon, San Diego.

F. IO, Gabb.

? *F. Io*, Gabb; Vol. 1, p. 101, pl. 28, fig. 214.
Tejon Group, Tejon.

TURBINELLA, Lam. **T. CRASSITESTA**, Gabb.

Turbinella crassitesta, Gabb; Vol. 2, p. 157, pl. 26, fig. 37.
Martinez Group, Martinez.

VOLUTILITHES, Swains. **V. NAVARROENSIS**, Shum. ?

V. Navarroensis, Shum.; Proc. Bost. Soc. N. Hist., 1861, Vol. 8, p. 192.
Id., ? Gabb; Vol. 1, p. 102, pl. 19, fig. 56.
Chico Group, Tuscan Springs, Pence's, Jacksonville, Oregon, Siskiyou Mountains, Chico Creek, Cow Creek.

MITRA, Lam. M. CRETACEA, Gabb.

Mitra cretacea, Gabb; Vol. 1, p. 103, pl. 28, fig. 215.

Id., Gabb; Vol. 2, p. 158.

Tejon Group, Martinez.

WHITNEYA, Gabb. W. FIGUS, Gabb.

Whitneya ficus, Gabb; Vol. 1, p. 104, pl. 28, fig. 216.

Tejon Group, Tejon.

FIGUS, Bolt. F. MAMILLATUS, Gabb.

F. mamillatus, Gabb; Vol. 1, p. 211, pl. 32, fig. 276.

Tejon Group, Tejon.

FICOPSIS, Con. F. RÉMONDII, Gabb.

Fusus (Hemifusus) Rémondii, Gabb; Vol. 1, p. 87, pl. 18, fig. 36.

Tejon Group, Martinez, Clayton, Griswold's, Tejon.

F. HORNII, Gabb.

Fusus (Hemifusus) Hornii, Gabb; Vol. 1, p. 86, pl. 28, fig. 206.

Tejon Group, Tejon.

F. COOPERII, Gabb.

Fusus (Hemifusus) Cooperii, Gabb; Vol. 1, p. 86, pl. 28, fig. 207.

Tejon Group, Clayton, and San Diego.

UROSYCA, Gabb. U. CAUDATA, Gabb

U. caudata, Gabb; Vol. 2, p. 159, pl. 27, fig. 38.

Martinez Group, Martinez

SYCODES, Gabb. S. CYPRÆOIDES, Gabb.

? *Ficus cypræoides*, Gabb; Vol. 1, p. 105, pl. 19, fig. 58.

Sycodes cypræoides, Gabb; Vol. 2, p. 160.

Chico Group, Tuscan Springs, Texas Flat.

NATICA, Brug. N. UVASANA, Gabb.

Natica Uvasana, Gabb; Vol. 1, p. 212, pl. 32, fig. 277.

Tejon Group, Tejon.

LUNATIA, Lam. **L. AVELLANA**, Gabb.

L. avellana, Gabb; Vol. 1, p. 105, pl. 19, fig. 60.

Shasta Group, Cottonwood Creek.

L. SHUMARDIANA, Gabb.

L. Shumardiana, Gabb; Vol. 1, p. 106, pl. 19, fig. 61.

Martinez Group, Martinez; intermediate beds forming transition to the Tejon Group, Lower Lake, Lake County.

L. HORNII, Gabb.

L. Hornii, Gabb; Vol. 1, p. 106, pl. 29, fig. 217.

Tejon Group, Tejon.

L. NUCIFORMIS, Gabb.

L. nuciformis, Gabb; Vol. 1, p. 107, pl. 28, fig. 218.

Tejon Group, Clayton, Tejon, and (?) San Diego.

GYRODES, Con. **G. CONRADIANA**, Gabb.

Lunatia (?) *Gyrodes* *Conradiana*, Gabb; Vol. 1, p. 107, pl. 29, fig. 219.

Chico Group, Pacheco's Pass.

G. EXPANSA, Gabb.

Gyrodes expansa, Gabb; Vol. 1, p. 108, pl. 19, fig. 62, *a*, *b*, *c*.

Chico Group, Pence's, Cottonwood Creek, Tuscan Springs, Texas Flat, Siskiyou Mountains, and Jacksonville; Martinez Group, Martinez; and in the transition beds, Lower Lake.

NEVERITA, Risso. **N. SECTA**, Gabb.

N. secta, Gabb; Vol. 1, p. 108, pl. 29, fig. 220 *a*.

Tejon Group, Tejon.

N. GLOBOSA, Gabb.

Neverita globosa, Gabb; Vol. 2, p. 161, pl. 27, fig. 39.

Tejon Group, Griswold's, and New Idria.

NATICINA, Gray. *N. OBLIQUA*, Gabb.

N. obliqua, Gabb; Vol. 1, p. 109, pl. 21, fig. 112.

Catinus obliquus, Con.; Sm. Check List, No. 470.

Tejon Group, Martinez, Tejon.

AMAUROPSIS, Mörch. *A. OVIFORMIS*, Gabb.

A. oviformis, Gabb; Vol. 1, p. 109, pl. 19, fig. 63.

Chico Group, Tuscan Springs.

EUSPIRA, Agas. *E. ALVEATA*, Con., sp.

Natica alveata, Con.; Pacific R. R. Rep., Vol. 5, p. 321, pl. 2, fig. 8.

Amauropsis alveata, Gabb; Vol. 1, p. 110, pl. 19, fig. 59; pl. 21, fig. 111.

Ampullina alveata, Con.; Sm. Check List, No. 459.

Chico Group, Curry's, south of Mount Diablo; Martinez Group, Martinez; intermediate beds, Lower Lake; Tejon Group, Martinez, Clayton, Griswold's, Tejon, and San Diego.

AMPULLINA. *A. STRIATA*, Gabb.

A. striata, Gabb; Vol. 2, p. 161, pl. 27, fig. 40.

Martinez Group, Martinez.

MORIO, Montf. *M. (SCONSIA) TUBERCULATUS*, Gabb.

M. (Sconsia) tuberculatus, Gabb; Vol. 1, p. 104, pl. 19, fig. 57.

Tejon Group, Martinez, Clayton, Griswold's, Tejon, and San Diego.

SCALARIA, Lam. *S. (OPALIA) MATHEWSONII*, Gabb.

Scalaria (Opalia) Mathewsonii, Gabb; Vol. 1, p. 212, pl. 32, fig. 278.

Tejon Group, Martinez.

TEREBRA, Brug. *T. CALIFORNICA*, Gabb.

T. Californica, Gabb; Vol. 2, p. 162, pl. 27, fig. 41.

Tejon Group, Martinez.

CHEMNITZIA, d'Orb. *C. PLANULATA*, Gabb.

C. Spillmani, Gabb (*not Con.*); Vol. 1, p. 115, pl. 19, fig. 70.

C. planulata, Gabb; Vol. 2, p. 162.

Chico Group, Pence's.

NISO, Risso. **N. POLITA**, Gabb.

Niso polita, Gabb; Vol. 1, p. 116, pl. 21, fig. 113.

Tejon Group, Martinez, and Tejon.

CERITHIOPSIS, F. & H. **C. ALTERNATA**, Gabb.

Cerithiopsis alternata, Gabb; Vol. 1, p. 116, pl. 21, fig. 114, 114 a.

Tejon Group, Martinez, and east of Mount Diablo.

ARCHITECTONICA, Bolt. **A. VEATCHII**, Gabb.

A. Veatchii, Gabb; Vol. 1, p. 116, pl. 19, fig. 71.

Chico Group, Tuscan Springs.

A. COGNATA, Gabb.

A. cognata, Gabb; Vol. 1, p. 117, pl. 20, fig. 72, a, b, c, d, e

Tejon Group, Martinez, Clayton, Tejon

A. HORNII, Gabb.

A. Hornii, Gabb; Vol. 1, p. 117, pl. 29, fig. 224, a, b.

Tejon Group, Tejon.

A. INORNATA, Gabb.

A. inornata, Gabb; Vol. 1, p. 118, pl. 20, fig. 73.

Chico Group, Tuscan Springs; Martinez Group, Martinez.

DISCOHELIX, Dkr. **D. LEANA**, Gabb.

Discohelix Leana, Gabb; Vol. 1, p. 119, pl. 20, fig. 75.

Chico Group, Texas Flat, Placer County.

STRAPAROLLUS, Montf. **S. PAUCIVOLVUS**, Gabb.

S. paucivolvus, Gabb; Vol. 1, p. 120, pl. 20, fig. 76.

Chico Group, Texas Flat.

S. LENS, Gabb.

Straparollus lens, Gabb; Vol. 1, p. 120, pl. 20, fig. 77, a-d.

Chico Group, Texas Flat.

CONUS, Linn. **C. RÉMONDII**, Gabb.

Conus Rémondii, Gabb; Vol. 1, p. 122, pl. 20, fig. 79.

Volutilithes Californica, Con.; Pacific R. R. Rep., Vol. 5, p. 322, pl. 2, fig. 9.

Tejon Group, Martinez, Clayton, Cochrane's, Tejon, San Diego.

C. HORNII, Gabb.

C. Hornii, Gabb; Vol. 1, p. 122, pl. 29, fig. 226.

Tejon Group, Tejon.

PUGNELLUS, Con. **P. HAMULUS**, Gabb.

P. hamulus, Gabb; Vol. 1, p. 124, pl. 20, fig. 81; pl. 18, fig. 48.

Pugnellus hamulus, Gabb; Vol. 2, p. 162, pl. 27, fig. 42, 42 a.

Martinez Group, Martinez.

P. (GYMNARUS) MANUBRIATUS, Gabb.

Pugnellus manubriatus, Gabb; Vol. 1, p. 125, pl. 29, fig. 229 a.

P. (Gymnarus) manubriatus, Gabb; Amer. Jour. Conch., 1868, p. 139.

Id., Gabb; Vol. 2, p. 163.

Chico Group, Cottonwood Creek, Siskiyou County.

RIMELLA, Agas. **R. CANALIFERA**, Gabb.

Rostellaria (Rimella) canalifera, Vol. 1, p. 123, pl. 29, fig. 228.

Rimella canalifera, Gabb; Proc. Cal. A. N. S., 1866.

Tejon Group, Martinez and Tejon.

R. SIMPLEX, Gabb.

Rostellaria (Rimella) simplex, Gabb; Vol. 1, p. 124, pl. 20, fig. 80.

Rimella simplex, Gabb; Proc. Cal. A. N. S., 1866.

Tejon Group, Clayton, San Diego.

CYPRÆA, Linn. **C. (LUPONIA) BAYERQUEI**, Gabb.

Cypræa Bayerquei, Gabb; Vol. 1, p. 129, wood cuts.

C. (L.) Bayerquei, Gabb; Vol. 2, p. 163, pl. 27, fig. 43, a, b, c.

Tejon Group, Martinez, Clayton, Tejon.

C. (EPONA) MATHEWSONII, Gabb.

C. (E.) Mathewsonii, Gabb; Vol. 2, p. 164, pl. 27, fig. 44, a, b.

Tejon Group, Martinez.

ANCHURA, Con. **A. FALCIFORMIS**, Gabb.

Aporrhais falciformis, Gabb; Vol. 1, p. 127, pl. 20, fig. 83.

Anchura falciformis, Gabb; Amer. Jour. Conch., 1868, p. 145.

A. falciformis, Gabb; Vol. 2, p. 165.

Chico Group, Tuscan Springs, Chico, Pence's, Texas Flat.

A. ANGULATA, Gabb.

Aporrhais angulata, Gabb; Vol. 1, p. 128, pl. 20, fig. 84.

Martinez, and (?) Huling Creek, Shasta County.

A. CALIFORNICA, Gabb.

Aporrhais Californica, Gabb; Vol. 1, p. 128, pl. 29, fig. 230, *a*, *b*.

Chico Group, Orestimba, Martinez, Puerto Cañon, and Siskiyou Mountains.

A. EXILIS, Gabb.

Aporrhais exilis, Gabb; Vol. 1, p. 129, pl. 29, fig. 231.

Martinez (?) Group, Martinez.

A. TRANSVERSA, Gabb.

A. transversa, Gabb; Vol. 2, p. 165, pl. 27, fig. 45.

Martinez Group, Martinez.

? A. CARINIFERA, Gabb.

? *A. carinifera*, Gabb; Vol. 2, p. 166, pl. 28, fig. 46.

Martinez Group, Martinez.

HELICAULAX, Gabb. **H. BICARINATA**, Gabb.

H. bicarinata, Gabb; Vol. 2, p. 166, pl. 27, fig. 47.

Shasta Group, Cottonwood Creek.

H. COSTATA, Gabb.

H. costata, Gabb; Vol. 2, p. 167, pl. 28, fig. 48.

Martinez Group, Martinez.

TESSAROLAX, Gabb. **T. DISTORTA**, Gabb.

T. distorta, Gabb; Vol. 1, p. 126, pl. 20, fig. 82, *a*, *b*.

Chico Group, Tuscan Springs.

LOXOTREMA, Gabb. **L. TURRITA**, Gabb.

Loxotrema turrita, Gabb; Amer. Jour. Conchology, 1868, p. 147.

L. turrita, Gabb; Vol. 2, p. 168, pl. 28, fig. 49.

Tejon Group, near Griswold's.

POTAMIDES, Brogn. **P. DIADEMA**, Gabb.

Potamides diadema, Gabb; Vol. 1, p. 130, pl. 20, fig. 85.

Shasta Group, Cottonwood Creek.

P. TENUIS, Gabb.

Potamides tenuis, Gabb; Vol. 1, p. 130, pl. 20, fig. 86.

Chico Group, Pence's.

LITTORINA, Ferr. **L. COMPACTA**, Gabb.

? *Littorina compacta*, Gabb; Vol. 1, p. 131, pl. 20, fig. 89.

Chico Group, Texas Flat, Placer County.

ATRESIUS, Gabb. **A. LIRATUS**, Gabb.

A. liratus, Gabb; Vol. 2, p. 169, pl. 28, fig. 50.

Shasta Group, Colusa County.

TURRITELLA, Lam. **T. INFRALINEATA**, Gabb.

T. infralineata, Gabb; Vol. 1, p. 131, pl. 20, fig. 87.

Chico Group, Cottonwood Creek, and Orestimba.

T. INFRAGRANULATA, Gabb.

T. infragranulata, Gabb; Vol. 1, p. 212, pl. 32, fig. 279.

Martinez (?) Group, Martinez.

T. SERIATIM-GRANULATA, Roem.

T. seriatim-granulata, Roem; Kreid. Tex., p. 39, pl. 4, fig. 12.

T. planilateralis, Con.; Emory's Rep., Mex. Boundary, p. 158, pl. 14, fig. 1.

T. irrorata, Con.; Proc. Phil. Acad., 1855, p. 268.

Chico Group, Tuscan Springs, Cottonwood Creek, Shasta County, and Cottonwood Creek, Siskiyou County. Also found in Texas, and at Arivechi, Sonora.

T. VEATCHII, Gabb.

T. Veatchii, Gabb; Vol. 1, p. 133, pl. 20, fig. 90.
Chico Group, Tuscan Springs.

T. CHICOENSIS, Gabb.

T. Chicoensis, Gabb; Vol. 1, p. 133, pl. 21, fig. 91.
Chico Group, Chico Creek.

T. UVASANA, Con.

Turritella Uvasana, Con.; Pacific R. R. Rep., Vol. 5, p. 321, pl. 2, fig. 12.
Id., Gabb; Vol. 1, p. 134, pl. 21, fig. 92.
Tejon Group, Martinez, Tejon, Clayton, and Griswold's.

T. SAFFORDII, Gabb.

T. Saffordii, Gabb; Jour. Phil. Acad., 2 Ser., Vol. 4, p. 392, pl. 68, fig. 12.
Id., Gabb; Vol. 1, p. 135, pl. 21, fig. 93.
Compare *T. (Torcula) dispassa*, Stol.; Pal. Ind., Gast., pl. 16, figs. 13, 14.
Martinez Group, Martinez, and near Suisun; beds between Martinez and
Tejon Groups, near Lower Lake Village. Also in the Ripley Group in
Tennessee and New Jersey (and India?).

T. ROBUSTA, Gabb.

Turritella robusta, Gabb; Vol. 1, p. 135, pl. 21, fig. 94.
Chico Group, Tuscan Springs.

T. MARTINEZENSIS, Gabb.

T. Martinezensis, Gabb; Vol. 2, p. 169, pl. 28, fig. 51.
Beds intermediate between the Martinez and Tejon Groups, Martinez.

GALERUS, Humph. **G. EXCENTRICUS**, Gabb.

G. excentricus, Gabb; Vol. 1, p. 136, pl. 20, fig. 95; pl. 29, fig. 232.
Tejon Group, Martinez. Clayton, San Diego, Tejon, &c.

SPIROCRYPTA, Gabb. **S. PILEUM**, Gabb.

Crypta (Spirocrypta) pileum, Gabb; Vol. 1, p. 137, pl. 29, fig. 233, *a, b*.
Tejon Group, Tejon, New Idria.

NERITA, Linn. **N. DEFORMIS**, Gabb.

N. deformis, Gabb; Vol. 1, p. 137, pl. 21, fig. 96.
Shasta Group, Cottonwood Creek, Shasta County.

N. CUNEATA, Gabb.

N. cuneata, Gabb; Vol. 1, p. 137, pl. 21, fig. 97.

Chico Group, Tuscan Springs.

N. (THELIOSTYLA) TRIANGULATA, Gabb.

N. (T.) triangulata, Gabb; Vol. 2, p. 170, pl. 28, fig. 52 a.

Tejon Group, New Idria.

LYSIS, Gabb. **L. DUPLICOSTA**, Gabb.

Lysis duplicosta, Gabb; Vol. 1, p. 138, pl. 21, fig. 98.

Chico Group, Texas Flat.

CALLIOSTOMA, Swains. **C. RADIATUM**, Gabb.

C. radiatum, Gabb; Vol. 2, p. 170, pl. 28, fig. 53.

Chico Group, Texas Flat.

ATAPHRUS, Gabb. **A. CRASSUS**, Gabb.

Ataphrus crassus, Gabb; Vol. 2, p. 171, pl. 28, fig. 54.

Martinez (?) Group, Martinez.

ANGARIA, Bolt. **A. ORNATISSIMA**, Gabb.

A. ornatissima, Gabb; Vol. 1, p. 121, pl. 20, fig. 78.

Chico Group, Texas Flat, and Tuscan Springs.

MARGARITELLA, Meek and Hayden. **M. CRENULATA**, Gabb.

M. crenulata, Gabb; Vol. 1, p. 118, pl. 20, fig. 74.

Tejon Group, San Diego.

M. GLOBOSA, Gabb.

M. globosa, Gabb; Vol. 1, p. 119, pl. 29, fig. 225.

Chico (?) Group, Benicia.

M. ANGULATA, Gabb.

M. angulata, Gabb; Vol. 2, p. 172, pl. 28, fig. 55.

Chico Group, Martinez.

DENTALIUM, Linn. **D. NANAIMOENSIS**, Meek.

D. Nanaimoensis, Meek ; Tr. Alb. Inst., 1854, p. 44.
Chico Group, Nanaimo, Vancouver Island.

D. COOPERII, Gabb.

D. Cooperii, Gabb ; Vol. 1, p. 139, pl. 21, fig. 100.
Chico Group, Curry's, south side of Mount Diablo ; Martinez Group, Martinez ; Tejon Group, Martinez, Tejon, and San Diego.

D. STRAMINEUM, Gabb.

D. stramineum, Gabb ; Vol. 1, p. 139, pl. 21, fig. 101.
Associated with the preceding at each of the above localities.

GADUS, Rang. **G. PUSILLUS**, Gabb.

Dentalium (Ditrupe ?) pusillum, Gabb ; Vol. 1, p. 139, pl. 21, fig. 99.
Tejon Group, Martinez, Tejon.

EMARGINULA, Lam. **E. RADIATA**, Gabb.

E. radiata, Gabb ; Vol. 1, p. 140, pl. 21, fig. 102 a.
Chico Group, Texas Flat.

PATELLA, Linn. **P. TRASKII**, Gabb.

P. Traskii, Gabb ; Vol. 1, p. 140, pl. 21, fig. 103.
Chico Group, Texas Flat.

ACMÆA, Esch. ? **A. TEJONENSIS**, Gabb.

? *A. Tejonensis*, Gabb ; Vol. 2, p. 172, pl. 28, fig. 56.

HELCION, Montf. ? **H. CIRCULARIS**, Gabb.

H. circularis, Gabb ; Vol. 1, p. 141, pl. 29, fig. 234 a.
Martinez Group, Martinez.

H. DICHOTOMA, Gabb.

H. dichotoma, Gabb ; Vol. 1, p. 141, pl. 21, fig. 104. •
Chico Group, Texas Flat.

ANISOMYON, M. & H. A. MEEKII, Gabb.

A. Meekii, Gabb ; Vol. 1, p. 142, pl. 21, fig. 105.

Shasta Group, Cottonwood Creek.

CINULIA, Gray. C. OBLIQUA, Gabb.

Cinulia obliqua, Gabb ; Vol. 1, p. 111, pl. 19, fig. 64, *a, b, c*.

Chico Group, Tuscan Springs, Martinez, Pence's, Chico Creek, Texas Flat,
Cottonwood Creek (Shasta County), and Cottonwood Creek (Siskiyou
County).

C. MATHEWSONII, Gabb.

C. Mathewsonii, Gabb ; Vol. 1, p. 111, pl. 19, fig. 65.

Chico Group, Martinez, Orestimba.

RINGICULA, Desh. R. VARIA, Gabb.

Ringicula varia, Gabb ; Vol. 1, p. 112, pl. 29, fig. 222, *a, b*.

Chico Group, Cow Creek, Shasta County.

RINGINELLA, d'Orb. R. POLITA, Gabb.

R. polita, Gabb ; Vol. 2, p. 174, pl. 28, fig. 60.

Shasta Group, Colusa County.

R. PINGUIS, Gabb.

Cinulia pinguis, Gabb ; Vol. 1, p. 112, pl. 29, fig. 221, *a, b*.

? Martinez Group, Martinez.

NERINEA, DeFr. N. DISPAR, Gabb.

Nerinea dispar, Gabb ; Vol. 1, p. 113, pl. 19, fig. 66 *a*.

Shasta Group, Cottonwood Creek.

ACTÆONINA, d'Orb. A. PUPOIDES, Gabb.

? *A. pupoides*, Gabb ; Vol. 1, p. 113, pl. 19, fig. 67.

A. pupoides, Gabb ; Vol. 2, p. 173, pl. 28, fig. 57.

Shasta Group, Cottonwood Creek.

A. CALIFORNICA, Gabb.

A. Californica, Gabb ; Vol. 1, p. 114, pl. 19, fig. 68.

Chico Group, (?) Martinez, Benicia, and near Yreka.

ACTÆONELLA, d'Orb. **A. OVIFORMIS**, Gabb.

A. oviformis, Gabb; Vol. 2, p. 173, pl. 28, fig. 58.

Chico Group, (?) Cottonwood Creek.

ACTÆON, Montf. **A. IMPRESSUS**, Gabb.

A. impressus, Gabb; Vol. 1, p. 142, pl. 21, fig. 106.

Shasta Group, Cottonwood Creek.

LIOCIUM, Gabb. **L. PUNCTATUM**, Gabb.

Liocium punctatum, Gabb; Vol. 1, p. 174, pl. 28, fig. 59.

Shasta (?) Group, Colusa County.

GLOBICONCHA, d'Orb. **G. (PHASIANELLA ?) RÉMONDII**, Gabb.

G. (Phasianella ?) Rémondii, Gabb; Vol. 1, p. 114, pl. 19, fig. 69.

Chico (?) Group, Benicia.

CYLINDRITES, M. & L. **C. BREVIS**, Gabb.

Cylindrites brevis, Gabb; Vol. 1, p. 115, pl. 29, fig. 223.

Martinez Group, Martinez.

BULLA, Brug. **B. HORNII**, Gabb.

Bulla Hornii, Gabb; Vol. 1, p. 143, pl. 29, fig. 235.

Tejon Group, Tejon.

CYLICHNA, Lovén. **C. COSTATA**, Gabb.

Cylichna costata, Gabb; Vol. 1, p. 143, pl. 21, fig. 107.

Chico Group, Texas Flat, Pence's, Martinez; Martinez Group, Martinez; Tejon Group, Martinez, Clayton, Cochrane's, Tejon, and San Diego.

MEGISTOSTOMA, Gabb. **M. STRIATUM**, Gabb.

Megistostoma striatum, Gabb; Vol. 1, p. 144, pl. 21, fig. 108 a.

Tejon Group, Martinez.

ACEPHALA.

MARTESIA, Leach. **M. CLAUSA**, Gabb.

Martesia clausa, Gabb; Vol. 1, p. 145, pl. 22, fig. 115.

Chico Group, Pence's, Texas Flat, Tuscan Springs; Martinez Group, Martinez; Tejon Group, Martinez, Tejon, and ten miles west of Griswold's.

TURNUS, Gabb. **T. PLENUS**, Gabb.

Turnus plenus, Gabb; Vol. 1, p. 146, pl. 22, fig. 116.

Shasta Group, Cottonwood Creek; (? Chico Group, Pacheco's Pass).

SOLEN, Linn. **S. PARALLELUS**, Gabb.

Solen parallelus, Gabb; Vol. 1, p. 146, pl. 22, fig. 117.

Plectosolen parallelus, Con.; Sm. Check List, No. 241.

Tejon Group, Martinez, Marsh's and Tejon.

S. (HYPOGELLA) CUNEATUS, Gabb.

S. (Hypogella) cuneatus, Gabb; Vol. 2, p. 175, pl. 29, fig. 61.

Martinez Group, Martinez.

S. (HYPOGELLA) DIEGOENSIS, Gabb.

S. (Solen) diegoensis, Gabb; Vol. 1, p. 213, pl. 32, fig. 280.

Plectosolen diegoensis, Con.; Sm. Check List, No. 240.

S. (Hypogella) diegoensis, Gabb; Vol. 2, p. 176.

Tejon Group, San Diego.

PHARELLA, Gray. **P. ALTA**, Gabb.

Pharella alta, Gabb; Vol. 1, p. 147, pl. 22, fig. 118.

Martinez Group, Martinez.

SILIQUA, Muhlf. **S. OREGONENSIS**, Gabb.

Siliqua oregonensis, Gabb; Vol. 1, p. 147, pl. 29, fig. 237.

Chico Group, Siskiyou Mountains.

CORBULA, Brug. ? **C. PRIMORSA**, Gabb.

? *C. primorsa*, Gabb; Vol. 1, p. 148, pl. 22, fig. 120.

Tejon Group, Corral Hollow.

C. TRASKII, Gabb.

Corbula Traskii, Gabb; Vol. 1, p. 149, pl. 22, fig. 121 *a*.

Chico Group, Texas Flat, Tuscan Springs, and Pence's Ranch.

C. CULTRIFORMIS, Gabb.

Corbula cultriformis, Gabb; Vol. 1, p. 149, pl. 22, fig. 122.

Martinez Group, Martinez.

C. HORNII, Gabb

Corbula Hornii, Gabb; Vol. 1, p. 149, pl. 29, fig. 238.

Corbula Hornii, Gabb; Vol. 2, p. 176, pl. 29, fig. 62, *a*, *b*.

Tejon Group, Tejon.

C. PARILIS, Gabb.

Corbula parilis, Gabb; Vol. 1, p. 150, pl. 29, fig. 239 *a*.

Tejon Group, Martinez, Clayton, Cochrane's, Marsh's, Griswold's, and San Diego.

C. ALÆFORMIS, Gabb.

Corbula alæformis, Gabb; Vol. 2, p. 177, pl. 29, fig. 63.

Beds intermediate between the Martinez and Tejon Groups, Lower Lake, Lake County.

ANATINA, Lam. **A. TRYONIANA**, Gabb.

Anatina Tryoniana, Gabb; Vol. 1, p. 150, pl. 29, fig. 240.

Chico Group, Martinez.

A. INEQUILATERALIS, Gabb.

Anatina inequilateralis, Gabb; Vol. 1, p. 151, pl. 29, fig. 241

Chico Group, Siskiyou Mountains.

? A. LATA, Gabb.

? *Anatina lata*, Gabb; Vol. 1, p. 151, pl. 22, fig. 126.

Chico Group, Pence's.

A. QUADRATA, Gabb.

Anatina quadrata, Gabb; Vol. 2, p. 177, pl. 29, fig. 64.

Chico Group, Nanaimo, Vancouver Island.

THRACIA, Leach. ? *T. OCCIDENTALIS*, Meek.

? *Thracia occidentalis*, Meek ; Trans. Alb. Inst., Vol. 4, p. 43.
Chico Group, Nanaimo, Vancouver Island.

? *T. SUBTRUNCATA*, Meek.

? *Thracia subtruncata*, Meek ; *loc. cit.*, p. 44.
With the preceding.

PHOLADOMYA, Sowb. *P. SUBELONGATA*, Meek.

Pholadomya subelongata, Meek ; Tr. Alb. Inst., Vol. 4, p. 42.
Chico Group, Nanaimo, Vancouver Island.

P. BREWERII, Gabb.

Pholadomya Brewerii, Gabb ; Vol. 1, p. 152, pl. 22, fig. 123.
Chico Group, Pence's Ranch.

P. NASUTA, Gabb.

Pholadomya nasuta, Gabb ; Vol. 1, p. 152, pl. 30, fig. 124.
Martinez Group, Martinez.

P. OREGONENSIS, Gabb.

Pholadomya Oregonensis, Gabb ; Vol. 2, p. 178, pl. 29, fig. 65.
Chico Group, Siskiyou Mountains.

GONIOMYA, Agas. *G. BOREALIS*, Meek.

Pholadomya (Goniomya) borealis, Meek ; Tr. Alb. Inst., Vol. 4, p. 41.
Chico Group, Nanaimo, Vancouver Island.

PLEUROMYA, Agas. *P. PAPYRACEA*, Gabb.

Pleuromya papyracea, Gabb ; Vol. 2, p. 178, pl. 29, fig. 66.
Shasta Group, Cottonwood Creek.

ARCOMYA, Agas. *A. UNDULATA*, Gabb.

Arcomya undulata, Gabb ; Vol. 2, p. 179, pl. 29, fig. 67.
Chico or Shasta Group, Indian Creek, Butte County.

HOMOMYA, Agas. **H. CONCENTRICA**, Gabb.

Panopæa concentrica, Gabb; Vol. 1, p. 148, pl. 22, fig. 119.

Homomya concentrica, Gabb; Vol. 2, p. 179.

Chico Group, Tuscan Springs, Cottonwood Creek, and Martinez.

NEÆRA, Gray. **N. DOLABRÆFORMIS**, Gabb.

Neæra dolabræformis, Gabb; Vol. 1, p. 153, pl. 22, fig. 125.

Tejon Group, Martinez.

MACTRA, Linn. ? **M. TENUISSIMA**, Gabb.

? *Mactra tenuissima*, Gabb; Vol. 1, p. 179, pl. 29, fig. 68.

Martinez Group, Martinez.

M. GIBBSANA, Meek.

Mactra Gibbsana, Meek; Proc. Phil. Acad., 1861, p. 315.

Cret.?, Island in Gulf of Georgia.

CYMBOPHORA, Gabb. **C. ASHBURNERII**, Gabb.

Mactra Ashburnerii, Gabb; Vol. 1, p. 153, pl. 22, fig. 127.

Cymbophora Ashburnerii, Gabb; Vol. 2, p. 181, pl. 29, fig. 69.

Chico Group, Pence's, Chico Creek, Texas Flat, Martinez, Tuscan Springs, Orestimba, Benicia, and San Luis Gonzaga; Martinez Group, Martinez and Benicia; Tejon Group, Martinez, Marsh's, Clayton, Griswold's, and Tejon.

LUTRARIA, Lam. **L. TRUNCATA**, Gabb.

Lutraria truncata, Gabb; Vol. 1, p. 154, pl. 22, fig. 128.

Chico Group, Pence's and Chico Creek.

ASAPHIS, Modeer. **A. UNDULATA**, Gabb.

Asaphis undulata, Gabb; Vol. 1, p. 154, pl. 22, fig. 129.

Chico Group, Texas Flat.

A. MULTICOSTATA, Gabb.

Asaphis multicostata, Gabb; Vol. 2, p. 181, pl. 29, fig. 70.

Chico Group, Crooked River of Des Chutes, Eastern Oregon.

GARI, Schum. **G. TEXTA**, Gabb.

? *Gari texta*, Gabb ; Vol. 1, p. 155, pl. 22, fig. 130.

Tejon Group, Martinez.

TELLINA, Linn. **T. LONGA**, Gabb.

Tellina longa, Gabb ; Vol. 1, p. 155, pl. 22, fig. 131.

Tejon Group, Martinez, Marsh's, Clayton, Tejon.

T. RÉMONDII, Gabb.

Tellina Rémondii, Gabb ; Vol. 1, p. 156, pl. 22, fig. 132.

Id., Gabb ; Vol. 2, p. 182, pl. 29, fig. 71.

Tejon Group, Martinez, Clayton, Cochrane's, Tejon.

T. HOFFMANNIANA, Gabb.

Tellina Hoffmanniana, Gabb ; Vol. 1, p. 156, pl. 22, fig. 133 *a*.

Tellina Hoffmanniana, Gabb ; Vol. 2, p. 182, pl. 30, fig. 72.

Chico Group, Pence's ; Martinez Group, Martinez ; Tejon Group, Griswold's, and Martinez.

T. MONILIFERA, Gabb.

Tellina monilifera, Gabb ; Vol. 1, p. 157, pl. 22, fig. 134 *a*.

Chico Group, Texas Flat.

T. OOIDES, Gabb.

Tellina ooides, Gabb ; Vol. 1, p. 157, pl. 22, fig. 135 *a*.

Chico Group, Martinez, Pence's.

T. MATHEWSONII, Gabb.

Tellina Mathewsonii, Gabb ; Vol. 1, p. 158, pl. 23, fig. 136.

Chico Group, Martinez.

T. DECURTATA, Gabb.

Tellina decurtata, Gabb ; Vol. 1, p. 158, pl. 23, fig. 137.

Chico Group, Pence's.

? T. QUADRATA, Gabb.

? *Tellina quadrata*, Gabb ; Vol. 1, p. 159, pl. 23, fig. 138.

Chico Group, Tuscan Springs.

T. ASHBURNERII, Gabb.

Tellina Ashburnerii, Gabb; Vol. 1, p. 159, pl. 23, fig. 139.
Chico Group, Pence's.

T. PARILIS, Gabb.

Tellina parilis, Gabb; Vol. 1, p. 160, pl. 30, fig. 243.
Chico Group, Martinez.

T. HORNII, Gabb.

Tellina Hornii, Gabb; Vol. 1, p. 160, pl. 30, fig. 244
Tejon Group, Tejon, Clayton.

T. CALIFORNICA, Gabb.

Tellina Californica, Gabb; Vol. 1, p. 161, pl. 30, fig. 245.
Tejon Group, Marsh's, Tejon.

T. ÆQUALIS, Gabb.

Tellina æqualis, Gabb; Vol. 2, p. 182, pl. 29, fig. 73.
Martinez Group, Martinez.

? T. UNDULIFERA, Gabb.

? *Tellina undulifera*, Gabb; Vol. 2, p. 183, pl. 30, fig. 74.
Martinez Group, Martinez.

T. (? SANGUINOLARIA) WHITNEYI, Gabb.

Tellina (? Sanguinolaria) Whitneyi, Gabb; Vol. 1, p. 160, pl. 30, fig. 242.
Chico Group, Jacksonville, Oregon.

DONAX, Linn. **D. LATUS**, Gabb.

Donax latus, Gabb; Vol. 2, p. 183, pl. 30, fig. 75.
Tejon Group, ten miles west of Griswold's.

VENUS, Linn. **V. VEATCHII**, Gabb.

Venus Veatchii, Gabb; Vol. 1, p. 162, pl. 23, fig. 142.
Chico Group, Tuscan Springs.

V. LENTICULARIS, Gabb.

Venus lenticularis, Gabb; Vol. 1, p. 162, pl. 30, fig. 246.
Chico Group, Benicia.

V. TETRAHEDRA, Gabb.

Venus tetrahedra, Gabb; Vol. 1, p. 163, pl. 30, fig. 247.
Chico Group, Martinez.

V. ÆQUILATERALIS, Gabb.

Venus æquilateralis, Gabb; Vol. 2, p. 184, pl. 30, fig. 76.
Tejon Group, San Diego.

CHIONE, Mühlf. ? C. ANGULATA, Gabb.

? *Chione angulata*, Gabb; Vol. 1, p. 213, pl. 32, fig. 281.
Martinez Group, Martinez.

C. VARIANS, Gabb.

Venus (Mercenaria ?) varians, Gabb; Vol. 1, p. 161, pl. 23, fig. 140, 141.
Dione varians, Con.; Sm. Check List, No. 188.
Chico Group, Jacksonville, Siskiyou Mountains, Pence's, Tuscan Springs,
Cow Creek, Chico Creek, Folsom, Texas Flat, Benicia, Martinez, Curry's,
and Orestimba; Martinez Group, Martinez, and Benicia.

MERETRIX, Lam. M. UVASANA, Con.

Meretrix Uvasana, Con.; P. R. R. Rep., Vol. 5, p. 320, pl. 2, fig. 3.
Id., Gabb; Pal. Cal., Vol. 1, p. 163, pl. 30, fig. 248.
Dione Uvasana, Con.; Sm. Check List, No. 187.
Tejon Group, Martinez, Clayton, Cochrane's, Tejon, New Idria, Griswold's,
San Diego, and elsewhere.

M. LENS, Gabb.

Meretrix lens, Gabb; Vol. 1, p. 164, pl. 23, fig. 143.
Chico Group, Chico Creek.

M. HORNII, Gabb.

Meretrix Hornii, Gabb; Vol. 1, p. 164, pl. 23, fig. 144.
Id., Gabb; Vol. 2, p. 185, pl. 30, fig. 78.
Tejon Group, Tejon.

M. LONGA, Gabb.

Meretrix longa, Gabb; Vol. 1, p. 165, pl. 23, fig. 147.
Chico Group, Texas Flat. (?)

M. ARATA, Gabb.

Meretrix arata, Gabb; Vol. 1, p. 166, pl. 30, fig. 250.
Chico Group, Orestimba, Siskiyou Mountains, and Cottonwood Creek, Shasta
County.

M. OVALIS, Gabb.

Meretrix ovalis, Gabb; Vol. 1, p. 166, pl. 30, fig. 251.
Tejon Group, Tejon.

M. CALIFORNICA, Con.

Meretrix Californica, Con.; P. R. R. Rep., Vol. 5, p. 320, pl. 2, fig. 4.
Dione Californiana, Con.; Sm. Check List, No. 174.
Tejon Group, Tejon.

? M. FRAGILIS, Gabb.

? *Meretrix fragilis*, Gabb; Vol. 2, p. 185, pl. 30, fig. 77.
Martinez Group, Martinez.

CARYATIS, Roem. **C. NITIDA**, Gabb.

Meretrix nitida, Gabb; Vol. 1, p. 165, pl. 23, fig. 145, 146.
Caryatis nitida, Gabb; Vol. 2, p. 186, pl. 30, fig. 79.
Chico Group, Martinez, Orestimba, Chico and Cow Creeks.

DOSINIA, Scopoli. **D. ELEVATA**, Gabb.

Dosinia elevata, Gabb; Vol. 1, p. 167, pl. 30, fig. 252.
D. alta, Con.; (non Dkr.) P. R. R. Rep., Vol. 5, p. 320, pl. 2, fig. 2.
Dosiniopsis alta, Con.; Sm. Check List, No. 162.
Not *Dosinia alta*, Con.; Proc. Phil. Acad., 1856, p. 315.
Tejon Group, Tejon.

? D. TENUIS, Meek.

? *Dosinia tenuis*, Meek; Proc. Phil. Acad., 1861, p. 315.
Chico Group, Vancouver Island.

D. PERTENUIS, Gabb.

Dosinia pertenuis, Gabb; Vol. 1, p. 167, pl. 30, fig. 253.

Chico Group, Siskiyou Mountains.

D. GYRATA, Gabb.

Dosinia gyrata, Gabb; Vol. 1, p. 168, pl. 28, fig. 148.

Lucina gyrata, Con.; Sm. Check List, No. 139.

Tejon Group, Martinez, Clayton, Marsh's, Griswold's, Tejon, and San Diego.

D. INFLATA, Gabb.

Dosinia inflata, Gabb; Vol. 1, p. 168, pl. 23, fig. 149.

Chico Group, Chico Creek.

TAPES, Megerle. T. CONRADIANA, Gabb.

Tapes Conradiana, Gabb; Vol. 1, p. 169, pl. 32, fig. 282.

Dione Conradiana, Con.; Sm. Check List, No. 173

Tejon Group, Martinez, Clayton, Tejon, Griswold's; transition beds between the Tejon and Martinez Group, Lower Lake, Lake County.

? T. QUADRATA, Gabb.

? *Tapes quadrata*, Gabb; Vol. 1, p. 169, pl. 30, fig. 249.

Tejon Group, Martinez, Clayton, Tejon.

? T. CRETACEA, Gabb.

? *Tapes cretacea*, Gabb; Vol. 1, p. 214, pl. 32, fig. 283.

Tejon Group, Corral Hollow.

THETIS, Sby. ? T. ELONGATA, Gabb.

? *Thetis elongata*, Gabb; Vol. 2, p. 186, pl. 30, fig. 80.

Shasta Group, Cottonwood Creek.

TRAPEZIUM, Mühlf. T. CARINATUM, Gabb.

T. carinatum, Gabb; Vol. 1, p. 170, pl. 23, fig. 150.

Chico Group, Texas Flat.

DIODUS, Gabb. **D. TENUIS**, Gabb.

* *Cyprinella tenuis*, Gabb ; Vol. 1, p. 170, pl. 23, fig. 151.

Tejon Group, Corral Hollow.

CARDIUM, Linn. **C. RÉMONDIANUM**, Gabb.

Cardium Rémondianum, Gabb ; Vol. 1, p. 172, pl. 23, fig. 153.

Chico Group, Benicia, and Wright's Gulch, Shasta County.

C. COOPERII, Gabb.

Cardium Cooperii, Gabb ; Vol. 1, p. 172, pl. 24, fig. 154 a.

Tejon Group, Martinez, Tejon, and San Diego.

C. SCITULUM, Meek.

C. scitulum, Meek ; Trans. Alb. Inst., Vol. 4, p. 40.

Chico Group, Nanaimo, Vancouver Island.

C. BREWERII, Gabb.

Cardium Brewerii, Gabb ; Vol. 1, p. 173, pl. 24, fig. 155.

Tejon Group, Martinez, Clayton, Griswold's. and Tejon.

C. (LÆVICARDIUM) LINTEUM, Con.

Cardium linteum, Con. ; Pacific R. R. Rep., Vol. 5, p. 320, pl. 2, fig. 1.

Lævicardium linteum, Con. ; Sm. Check List, No. 152.

Tejon Group, Tejon.

C. (LÆVICARDIUM) ANNULATUM, Gabb.

Cardium (Lævicardium) annulatum, Gabb ; Vol. 1, p. 171, pl. 23, fig. 152.

Id., Gabb ; Vol. 2, p. 187, pl. 30, fig. 81.

Chico Group, Martinez, Curry's, Orestimba.

C. (PROTOCOLDIUM) PLACERENSIS, Gabb.

Cardium (Protocolidium) Placerensis, Gabb ; Vol. 1, p. 173, pl. 24, fig. 156.

Chico Group, Texas Flat.

* *Cyprinella* being preoccupied in ichthyology, I propose to substitute the present name for the genus.

C. (PROTOCOLDIUM) TRANSLUCIDUM, Gabb.

Cardium (Protocardium) translucidum, Gabb; Vol. 2, p. 187, pl. 30, fig. 82 a.
Chico Group, Martinez.

CARDITA, Brug. **C. HORNII**, Gabb.

C. planicosta, Con. (not Lam.); P. R. R. Rep., Vol. 5, p. 321, pl. 2, fig. 6.
Cardita Hornii, Gabb; Vol. 1, p. 174, pl. 24, fig. 157.
C. Hornii, Gabb; Vol. 2, p. 187, pl. 30, fig. 83 a.
Tejon Group, Martinez, Clayton, Griswold's, New Idria, and Tejon.

C. VENERIFORMIS, Gabb.

Cardita veneriformis, Gabb; Vol. 1, p. 215, pl. 32, fig. 285 a.
Martinez Group, Martinez.

CLISOCOLUS, Gabb. **C. DUBIUS**, Gabb.

Loripes dubia, Gabb; Vol. 1, p. 177, pl. 24, fig. 170, 171.
Clisocolus dubius, Gabb; Vol. 2, p. 189, pl. 30, fig. 84.
Chico Group, Texas Flat, Chico Creek, and Tuscan Springs.

LUCINA, Brug. **L. NASUTA**, Gabb.

Lucina nasuta, Gabb; Vol. 1, p. 175, pl. 24, fig. 159.
Martinez Group, Martinez.

L. POSTICE-RADIATA, Gabb.

Lucina postradiata, Gabb; Vol. 1, p. 175, pl. 54, fig. 158.
Chico Group, Texas Flat.

L. SUBCIRCULARIS, Gabb.

Lucina subcircularis, Gabb; Vol. 1, p. 176, pl. 24, fig. 160.
Chico Group, Texas Flat.

L. CUMULATA, Gabb.

Lucina cumulata, Gabb; Vol. 1, p. 176, pl. 24, fig. 254.
Tejon Group, Tejon.

? L. CRETACEA, Gabb.

? *Lucina cretacea*, Gabb, Vol. 1, p. 177, pl. 30, fig. 255.
Tejon Group, Clayton to Marsh's.

MYSIA, Leach. ? **M. POLITA**, Gabb.

? *Mysia polita*, Gabb; Vol. 1, p. 178, pl. 30, fig. 256.

Tejon Group, Martinez, Clayton, New Idria, and Tejon.

ASTARTE, Sowb. **A. CONRADIANA**, Gabb.

Astarte Conradiana, Gabb; Vol. 1, p. 178, pl. 24, fig. 161.

Chico Group, Texas Flat.

A. MATHEWSONII, Gabb.

Astarte Mathewsonii, Gabb; Vol. 1, p. 179, pl. 30, fig. 258.

Chico Group, Martinez.

A. TUSCANA, Gabb.

Astarte Tuscana, Gabb; Vol. 1, p. 179, pl. 30, fig. 257.

Chico Group, Tuscan Springs, Pence's.

ERIPHYLE, Gabb. **E. UMBONATA**, Gabb.

Eriphyla umbonata, Gabb; Vol. 1, p. 18, pl. 24, fig. 162 a.

Chico Group, Cow Creek, and south of Mount Diablo.

CRASSATELLA, Lam. **C. GRANDIS**, Gabb.

Crassatella alta, Con.; P. R. R. Rep., Vol. 5, p. 321.

C. alta, Con.; Smithsonian Check List, Eocene, No. 104.

Not *C. alta*, Con.; Tert. Foss., p. 21, fig. 7.

C. grandis, Gabb; Vol. 1, p. 181, pl. 24, fig. 163.

C. grandis, Gabb; Vol. 2, p. 189.

Tejon Group, Clayton, Tejon. Intermediate beds, Lower Lake.

C. COMPACTA, Gabb.

Crassatella compacta, Gabb; Vol. 2, p. 190, pl. 30, fig. 85.

Martinez Group, Martinez.

C. UVASANA, Con.

Crassatella Uvasana, Con.; P. R. R. Rep., Vol. 5, p. 320, pl. 2, fig. 5.

Crassatella Uvasana, Gabb; Vol. 1, p. 214, pl. 32, fig. 284.

Tejon Group, Tejon.

ANTHONYA, Gabb. *A. CULTRIFORMIS*, Gabb.

Anthonya cultriformis, Gabb; Vol. 1, p. 182, pl. 30, fig. 236 *a*.
Chico Group, Martinez.

UNIO, Retz., Auct. *U. PENULTIMUS*, Gabb.

Unio penultimus, Gabb; Vol. 1, p. 182, pl. 24, fig. 164.
Tejon Group, Coal Mines, Clayton.

U. HUBBARDII, Gabb

Unio Hubbardii, Gabb; Vol. 2, p. 190, pl. 30, fig. 86.
Chico Group, Coal Mines, Nanaimo, Vancouver Island.

MYTILUS, Linn. *M. PAUPERCULUS*, Gabb.

Mytilus pauperculus, Gabb; Vol. 1, p. 183, pl. 25, fig. 165.
Martinez Group, Martinez.

M. ASCIA, Gabb.

Mytilus ascia, Gabb; Vol. 1, p. 183, pl. 30, fig. 259.
Tejon Group, Tejon.

M. HUMERUS, Con.

Mytilus humerus, Con.; P. R. R. Rep., Vol. 5, p. 321, pl. 2, fig. 10.
Tejon Group, Tejon.

M. QUADRATUS, Gabb.

Mytilus quadratus, Gabb; Vol. 2, p. 191, pl. 31, fig. 87.
Inoceramus Picchii, Gabb (*pars*); Vol. 1, pl. 25, fig. 174.
Chico Group, Martinez, and Tuscan Springs

MODIOLA, Lam. *M. SISKIYOUENSIS*, Gabb.

Modiola Siskiyouensis, Gabb; Vol. 1, p. 184, pl. 30, fig. 260.
Chico Group, Siskiyou Mountains, and Jacksonville.

M. ORNATA, Gabb.

Modiola ornata, Gabb; Vol. 1, p. 184, pl. 24, fig. 166.
Tejon Group, Martinez, Clayton, Cochrane's, Marsh's, Griswold's, New Idria,
and Tejon.

M. CYLINDRICA, Gabb. .

Modiola cylindrica, Gabb; Vol. 1, p. 185, pl. 25, fig. 167.

Chico Group, Pence's, Tuscan Springs, Martinez.

M. MAJOR, Gabb.

Modiola major, Gabb; Vol. 2, p. 191, pl. 31, fig. 88.

Shasta Group, Lake and Colusa Counties.

LITHOPHAGUS, Mühlf. **L. OVIFORMIS**, Gabb.

Lithophagus oviformis, Gabb; Vol. 1, p. 185, pl. 25, fig. 168.

Chico Group, Cow Creek.

SEPTIFER, Recluz. **S. DICHOTOMUS**, Gabb.

Septifer dichotomus, Gabb; Vol. 1, p. 186, pl. 30, fig. 261.

Tejon Group, Tejon.

STALAGMIUM, Con. **S. CONCENTRICUM**, Gabb, sp.

Crenella concentrica, Gabb; Vol. 1, p. 186, pl. 24, fig. 169.

Stalagmium concentricum, Con.; Sm. Check List, No. 96.

Tejon Group, Martinez.

AVICULA, Lam. **A. PELLUCIDA**, Gabb.

Avicula pellucida, Gabb; Vol. 1, p. 186, pl. 25, fig. 172

Tejon Group, Martinez, Griswold's, Tejon; transition beds, Lower Lake;

Martinez Group, Martinez; Chico Group, Siskiyou Mountains, San Luis,
Gonzaga.

MELEAGRINA, Lam. **M. ANTIQUA**, Gabb.

Meleagrina antiqua, Gabb; Vol. 2, p. 192, pl. 31, fig. 89.

Chico Group, Nanaimo, Vancouver Island.

INOCERAMUS, Sowb. **I. ELLIOTII**, Gabb.

Inoceramus Elliotii, Gabb; Vol. 2, p. 193, pl. 31, fig. 90 a.

Chico (?) Group, Alcatraz Island.

I. WHITNEYI, Gabb.

Inoceramus Whitneyi, Gabb; Vol. 2, p. 193, pl. 31, fig. 91.
Chico Group, Folsom.

I. SUBUNDATUS, Meek.

Inoceramus subundatus, Meek; Proc. Phil. Acad., 1861, p. 315.
Chico Group, Vancouver Island.

AUCELLA, Keys. A. PIOCHII, Gabb.

Inoceramus Piochii, Gabb; Vol. 1, p. 187, pl. 25, fig. 173 (exclus. fig. 174).
Aucella Piochii, Gabb; Vol. 2, p. 194, pl. 31, fig. 92, *a-c*.
Shasta Group, Mitchell Cañon, north side of Mount Diablo; Knoxville, Puta Creek, and elsewhere in Lake County; near the Simmons' Springs, and elsewhere, Colusa County, and at numerous other spots along the eastern face of the northern Coast Range; also southwest of San Jose, below the Almaden mines; and from Washington Territory.

PINNA, Linn. P. BREWERII, Gabb.

Pinna Brewerii, Gabb; Vol. 1, p. 188, pl. 25, fig. 175 *a*.
Id., Gabb; Vol. 2, p. 195, pl. 32, fig. 93.
Chico Group, Curry's, south of Mount Diablo, Martinez, Cottonwood Creek, Shasta County, and Cottonwood Creek, Siskiyou County.

TRIGONIA, Brug. T. TRYONIANA, Gabb.

Trigonia Tryoniana, Gabb; Vol. 1, p. 188, pl. 25, fig. 176.
Chico Group, Tuscan Springs.

T. EVANSANA, Meek.

Trigonia Evansana, Meek; Trans. Albany Inst., Vol. 4, p. 42.
T. Evansii, Gabb; Vol. 1, p. 189, pl. 25, fig. 177.
One of the most characteristic fossils on the West Coast, peculiar to the Chico Group, and found in California, at Pacheco's Pass, south of Mount Diablo, Orestimba, Martinez, Benicia, Tuscan Springs, Chico Creek, Pence's, Cottonwood Creek, Shasta County, Cottonwood Creek, Siskiyou County, Texas Flat, and Rag Cañon; in Oregon, at Jacksonville, on the Siskiyou Mountains, and on the Crooked River of the Des Chutes; and finally, on Vancouver Island, at Nanaimo, whence it was described by Mr. Meek.

T. GIBBONIANA, Lea.

Trigonia Gibboniana, Lea ; Trans. Am. Phil. Soc., 1840, p. 255, pl. 9, fig. 7.

T. Hondaana, Lea ; *loc. cit.*, p. 256, pl. 9, fig. 9.

T. Hondaana, d'Orb. ; Prod. Pal. Strat., Vol. 2, p. 106, No. 771.

T. Gibboniana, Gabb ; Vol. 1, p. 190, pl. 17, fig. 178 ; pl. 31, fig. 262.

Chico Group, Martinez, Jacksonville, and Crooked Creek of the Des Chutes.

T. ÆQUICOSTATA, Gabb.

Trigonia æquicostata, Gabb ; Vol. 2, p. 196.

Indet., Vol. 1, p. 209, pl. 26, fig. 198.

Chico Group, Orestimba, south of Mount Diablo, Martinez, Cottonwood Creek, Shasta County, and Jacksonville, Oregon.

MEEKIA, Gabb. M. SELLA, Gabb.

Meekia sella, Gabb ; Vol. 1, p. 191, pl. 25, fig. 179.

Martinez Group, Martinez ; Chico Group, Tuscan Springs, and Siskiyou Mountains.

M. RADIATA, Gabb.

Meekia radiata, Gabb ; Vol. 1, p. 192, pl. 25, fig. 179 a.

Chico Group, Pacheco's Pass, Orestimba, Tuscan Springs, Siskiyou Mountains, and Jacksonville, Oregon.

M. NAVIS, Gabb.

Meekia navis, Gabb ; Vol. 1, p. 192, pl. 25, fig. 180.

Chico Group, Martinez, Chico Creek, and Pence's.

ARCA, Lam. A. BREWERIANA, Gabb.

Arca Breweriana, Gabb ; Vol. 1, p. 193, pl. 25, fig. 181.

Chico Group, Cottonwood Creek, Tuscan Springs.

A. GRAVIDA, Gabb.

Arca gravida, Gabb ; Vol. 1, p. 194, pl. 30, fig. 264.

Chico Group, Pacheco's Pass, and Rag Cañon, Napa County.

A. DECURTATA, Gabb.

Arca decurtata, Gabb ; Vol. 1, p. 195, pl. 31, fig. 265 a.

Chico Group, Rag Cañon.

A. HORNII, Gabb.

Arca Hornii, Gabb; Vol. 1, p. 194, pl. 30, fig. 263.

Tejon Group, Tejon.

A. VANCOUVERENSIS, Meek.

Arca Vancouverensis, Meek; Trans. Alb. Inst., Vol. 4, p. 40.

Chico Group, Nanaimo, Vancouver Island.

BARBATIA, Gray. B. MORSEI, Gabb.

Barbatia Morsei, Gabb; Vol. 1, p. 216, pl. 32, fig. 286.

Tejon Group, San Diego.

CUCULLÆA, Lam. C. MATHEWSONII, Gabb.

Cucullæa Mathewsonii, Gabb; Vol. 1, p. 195, pl. 31, fig. 266.

Intermediate beds between the Tejon and Martinez Groups, Clayton, and Lower Lake; Martinez Group, Martinez.

C. TRUNCATA, Gabb.

Cucullæa truncata, Gabb; Vol. 1, p. 196, pl. 25, fig. 182.

Chico Group, Pacheco's Pass, Orestimba, south of Mount Diablo, Martinez, Benicia, Texas Flat, Tuscan Springs, and Jacksonville, Oregon.

C. EQUILATERALIS, Meek.

Arca (Cucullæa) equilateralis, Meek; Trans. Alb. Inst., Vol. 4, p. 39.

Chico Group, Nanaimo, Vancouver Island.

AXINÆA, Poli. A. VEATCHII, Gabb.

Axinæa Veatchii, Gabb; Vol. 1, p. 197, pl. 25, fig. 183 a.

Beds intermediate between the Tejon and Martinez Groups, Lower Lake; Martinez Group, Martinez; Chico Group, Tuscan Springs, Texas Flat, Pence's, Cow Creek, Orestimba, and San Diego.

A. SAGITTATA, Gabb.

Axinæa (Limopsis?) sagittata, Gabb; Vol. 1, p. 197, pl. 31, fig. 267 a.

Axinæa sagittata, Gabb; Vol. 2, p. 196.

Tejon Group, Tejon, Griswold's, and Martinez.

A. COR, Gabb.

Axinæa cor, Gabb; Vol. 1, p. 198, pl. 31, fig. 268 *a*.

Tejon Group, Martinez.

NUCULA, Lam. N. TRASKANA, Meek.

Nucula Traskana, Meek; Trans. Alb. Inst., Vol. 4, p. 39.

Chico Group, Nanaimo, Vancouver Island.

N. SOLITARIA Gabb.

Nucula solitaria, Gabb; Vol. 2, p. 197, pl. 32, fig. 94.

Chico Group, Texas Flat.

N. (ACILA) TRUNCATA, Gabb.

Nucula truncata, Gabb; Vol. 1, p. 198, pl. 26, fig. 184, *a*, *b*.

N. (Acila) truncata, Gabb; Vol. 2, p. 197.

Chico Group, Pence's, Tuscan Springs, Chico Creek, Texas Flat, Pacheco's Pass; Martinez Group, Martinez; Tejon Group, Martinez, and Tejon.

LEDA, Schum. L. GABBII, Con., sp.

Leda protexta?, Gabb; Vol. 1, p. 199, pl. 26, fig. 185.

Not *L. protexta*, Gabb; Jour. Phil. Acad., 2 Ser., Vol. 4, p. 303, pl. 48, fig. 23.

Nuculana Gabbii, Con.; Smithsonian Check List, No. 44.

Martinez Group, Martinez; Tejon Group, Martinez, Clayton, Griswold's, Tejon, and San Emidio.

L. TRANSLUCIDA, Gabb.

Leda translucida, Gabb; Vol. 1, p. 199, pl. 30, fig. 269.

Chico Group, Cow Creek.

LIMOPSIS, Sassi. L. TRANSVERSA, Gabb.

Limopsis transversa, Gabb; Vol. 1, p. 200, pl. 26, fig. 186.

Chico Group, Texas Flat.

PECTEN, Brug. P. TRASKII, Gabb.

Pecten Traskii, Gabb; Vol. 1, p. 200, pl. 26, fig. 187 *a*.

Id., Gabb; Vol. 2, p. 198, pl. 32, fig. 95.

Chico Group, Texas Flat, and Nanaimo, Vancouver Island.

P. OPERCULIFORMIS, Gabb.

Pecten operculiformis, Gabb; Vol. 1, p. 201, pl. 26, fig. 188.

Chico Group, Cottonwood and Huling Creeks, and south of Mount Diablo.

P. CALIFORNICUS, Gabb.

Pecten Californicus, Gabb; Vol. 1, p. 201, pl. 31, fig. 270.

Chico or Shasta Group, Cottonwood Creek, Shasta County.

P. MARTINEZENSIS, Gabb.

Pecten Martinezensis, Gabb; Vol. 2, p. 198, pl. 33, fig. 96.

Martinez Group, Martinez.

P. COMPLEXICOSTA, Gabb.

Pecten complexicosta, Gabb; Vol. 2, p. 199, pl. 33, fig. 97 a.

Shasta Group, Morgan Valley, Lake County.

P. INTERRADIATUS, Gabb.

Pecten interradiatus, Gabb; Vol. 2, p. 199, pl. 33, fig. 98 a.

Tejon Group, New Idria.

NEITHEA, Drouet. **N. GRANDICOSTA**, Gabb.

Neithea grandicosta, Gabb; Vol. 2, p. 200, pl. 33, fig. 99 a.

Shasta Group, Cottonwood Creek.

LIMA, Brug. **L. MICROTIS**, Gabb.

Lima microtis, Gabb; Vol. 1, p. 202, pl. 26, fig. 189.

Chico Group, Cottonwood Creek (and Texas Flat?).

L. APPRESSA, Gabb.

Lima appressa, Gabb; Vol. 1, p. 203, pl. 31, fig. 271.

Chico Group, Pacheco's Pass.

L. SHASTAENSIS, Gabb.

Lima Shastaensis, Gabb; Vol. 2, p. 201, pl. 33, fig. 100.

Shasta Group, Cottonwood Creek.

L. MULTIRADIATA, Gabb.

Lima multiradiata, Gabb; Vol. 2, p. 201, pl. 33, fig. 101.

Transition beds between Tejon and Martinez Group, Lower Lake, Lake County.

PLICATULA, Lam. P. VARIATA, Gabb.

Plicatula variata, Gabb; Vol. 1, p. 203, pl. 26, fig. 190.

Shasta Group, Battle Creek, Shasta County.

ANOMIA, Linn. A. LINEATA, Gabb.

Anomia lineata, Gabb; Vol. 1, p. 203, pl. 26, fig. 193.

Chico Group, Texas Flat, Pence's, Chico Creek.

A. VANCOUVERENSIS, Gabb.

Anomia Vancouverensis, Gabb; Vol. 2, p. 202, pl. 33, fig. 102.

Chico Group, Nanaimo, Vancouver Island.

PLACUNANOMIA, Brod. P. INORNATA, Gabb.

Placunanomia inornata, Gabb; Vol. 1, p. 217, pl. 32, fig. 288 a.

Tejon Group, Corral Hollow, and San Diego.

OSTREA, Linn. O. BREWERII, Gabb.

Ostrea Brewerii, Gabb; Vol. 1, p. 204, pl. 26, fig. 191.

Chico Group, Cow Creek.

O. MALLEIFORMIS, Gabb.

Ostrea malleiformis, Gabb; Vol. 1, p. 204, pl. 31, fig. 272.

Chico Group, Cottonwood Creek, Siskiyou County, and Jacksonville, Oregon.

O. IDRIAENSIS, Gabb.

Ostrea Idriaensis, Gabb; Vol. 2, p. 203, pl. 33, fig. 103, b, c; pl. 34, fig. 103 a.

Tejon Group, New Idria.

O. APPRESSA, Gabb.

Ostrea appressa, Gabb; Vol. 2, p. 203, pl. 34, fig. 104 a.

Tejon Group, Mendocino County.

GRYPHÆA, Lam. **G. VESICULARIS**, Lam., sp.

Ostrea vesicularis, Lam.; An. de Mus., Vol. 8, p. 160, pl. 22, fig. 3.

Gryphæa vesicularis, Bronn; Leth. Geog., pl. 32, fig. 1.

Chico (?) Group, San Diego.

EXOGYRA, Say. **E. PARASITICA**, Gabb.

Exogyra parasitica, Gabb; Vol. 1, p. 205, pl. 26, fig. 192, *a, b*; pl. 31, fig. 273 *a*.

Chico Group, Texas Flat, Folsom, Cottonwood Creek.

BRACHIOPODA.

TEREBRATELLA, d'Orb. **T. OBESA**, Gabb.

Terebratella obesa, Gabb; Vol. 1, p. 205, pl. 26, fig. 194.

Chico Group, Texas Flat.

RHYNCHONELLA, Fisch. **R. WHITNEYI**, Gabb.

Terebratella Whitneyi, Gabb; Vol. 2, p. 35, pl. 12, fig. 62 *a*.

Rhynchonella Whitneyi, Gabb; Vol. 2, p. 204, pl. 34, fig. 135, *a, b*.

Shasta Group, Lake and Colusa Counties.

ZOOPHYTA.

FLABELLUM, Lesson. **F. RÉMONDIANUM**, Gabb.

Flabellum Rémondianum, Gabb; Vol. 1, p. 207, pl. 26, fig. 199.

Tejon Group, Clayton.

SMILOTROCHUS, E. & H. ? **S. CURTUS**, Gabb.

Smilotrochus curtus, Gabb; Vol. 2, p. 205, pl. 34, fig. 106 *a*.

Martinez or Chico Group, Martinez.

TROCHOSMILIA, E. & H. **T. (ACROSMILIA) STRIATA**, Gabb.

T. (A.) striata, Gabb; Vol. 1, p. 207, pl. 26, fig. 195.

Tejon Group, Clayton.

T. (ELLIPSOSMILIA) GRANULIFERA, Gabb.

T. (E.) granulifera, Gabb; Vol. 1, p. 208, pl. 26, fig. 196 *a*.
Chico Group, Chico Creek.

ASTROCÆNIA, E. & H. ? A. PETROSA, Gabb.

? *Astrocænia petrosa*, Gabb; Vol. 1, p. 208, pl. 31, fig. 274 *a*.
Martinez Group, Martinez.

PALÆONTOLOGY OF CALIFORNIA.

VOL. II.

SECTION III.

DESCRIPTION OF CRETACEOUS FOSSILS

FROM MEXICO.

NOTES ON SOME
MEXICAN CRETACEOUS FOSSILS,

WITH DESCRIPTIONS OF NEW SPECIES.

THE following fossils were collected by my lamented friend, RÉMOND, several years ago, in the Sierra de las Conchas, near Arivechi, Sonora. When they were first received, I published a short notice of them, in the Proceedings of the California Academy of Natural Sciences, accompanied by some extracts from M. RÉMOND's letter, and mentioned the close relationship that obviously exists between this deposit and the Cretaceous of Texas; at the same time giving a list of the species identified, in hastily glancing over the collection. Although sufficiently accurate for the purpose, the list contained one or two errors in identification of species, due to the imperfect character of some of the specimens, in the first instalment received. In the present paper I have endeavored to correct the errors, and believe that I have correctly determined all the previously known species.

The occurrence of the Texan Cretaceous fauna on the western face of the Sierra Madre, is a matter of great interest, since it proves conclusively that during that era there must have been a water communication between the great Cretaceous sea, that covered so much of what is now the central portions of our continent, on the one side, and the Pacific on the other. It is the more remarkable when taken in connection with the fact, that of the more than three hundred species now known in the Californian Cretaceous, barely one per cent. is found in common on the two sides of the continent. From the occurrence in California of *Gryphæa vesicularis* and *Turritella seriatim-granulata*, determined

with certainty, and of *Nautilus Texanus* and *Volutilithes Navarroensis*, yet open to a doubt, it seems that there was not a continuous land barrier between the two basins. Three out of the four species enumerated, are from the Texan fauna, and are not known so far north as Nebraska, though beds of equivalent age are found in that Territory. It is very probable that future explorations in the yet unknown region between the Saskatchewan and the Pacific, north of our boundaries, will develop a more or less continuous series of Cretaceous deposits, showing a similar link on the north. The presence of *Ammonites complexus* on Vancouver Island, and in California, and the known existence of Cretaceous beds in Eastern Oregon, and northwest of the great lakes, render this hypothesis not improbable.

I need say but little about the age of this deposit. Dr. ROEMER, in his admirable work, "Kreidebildungen von Texas," has discussed the subject in so able a manner as to leave me nothing to add. He considers it to be on, or near, the horizon of the Lower Chalk; an opinion in which I fully concur.

So far as I am aware, this is only the second locality of Cretaceous rocks reported in the whole area of Mexico. In 1839, GALEOTTI published a paper in the Bulletin of the Brussels Academy, on some Jurassic fossils from Tehuacan, in the state of Puebla, some of which, at least, seem to belong to the Cretaceous, rather than to the Jurassic formation.

AMMONITES, Brug.

A. PEDERNALIS, Von Buch.

Pl. 35, Fig. 1, 1 a.

(*A. Pedernalis*, Von Buch; Ueber Cerat., p. 31, pl. 6, fig. 8-10.)

(*Id.*, Roem; Kreid. Tex., p. 34, pl. 1, fig. 3, a-c.)

(*Id.*, Con.; Emory's Report, pl. 15, fig. 1.)

(*Id.*, Gabb; Synop. Cret., Philos. Proc.; 1861, p. 14.)

(*A. pleurisepta*, Con.; Emory's Report, p. 159, *Pedernalis* on plate.)

A peculiar variety of this species, differing both from the figures in Kreid.

Texas, and that by Conrad in the Mexican Boundary Report, in having the dorsum distinctly channelled or flattened, and bordered by two angles, and in having the sides variously undulate or even subcostate. I have seen the flattened dorsum in Texan specimens; and the undulations of the sides, on the specimens before me, show by their variability that this is a character of no specific value. The septum is identical with the published figures.

FUSUS, Lam.

F. MEXICANUS, n. s.

Pl. 35, Fig. 2.

SHELL small, elongate fusiform; spire high, whorls five or six, angulated, top sloping; suture undulated. Surface ornamented by about ten large radiating ribs, crossed by numerous prominent revolving lines with broad interspaces; the longitudinal ribs commence at the suture and, on the body whorl, disappear about the middle. Aperture broad and biangular posteriorly, narrowed in advance; outer lip simple, inner lip incrustated; canal produced.

Length (both ends broken), .75 inch.

A peculiar species, having no near allies either in California or Texas.

LUNATIA, Lam.

L. PEDERNALIS, Roem., sp.

Pl. 35, Fig. 3.

(*Natica Pedernalis*, Roem.; Kreid. Tex., p. 43, pl. 4, fig. 1.)

Dr. Roemer seems to have been acquainted with this species only through internal casts, one of which he figures as above. I am fortunate in having had the opportunity of examining some half a dozen specimens retaining all the shell. The species is very thin, and nearly all have suffered more or less distortion. The specific characters are as follows.

SHELL large, ovate, thin; spire moderately produced; whorls five and a half, rounded; suture distinct. Aperture elongate ovate, acute behind, rounded in advance; outer lip simple, inner

lip broadly incrusted above, thickened in front of, and below the umbilicus. Umbilicus subperforate, a thin striate incrustation running up into it, and extending below, parallel with the anterior portion of the labium. Surface marked by faint lines of growth.

This is by far the largest *Naticoid* in the American Cretaceous, and, apart from its size, can be distinguished from all the other species by its elongate form and the striate umbilicus.

EUSPIRA, Agas.

E. TABULATA, n. s.

Pl. 35, Fig. 4.

SHELL thick, robust, pyriform; spire elevated turritid; whorls five; upper surface directly or obliquely truncated; suture faint. Body whorl flat above, concave immediately below the angle, and broadly expanded towards the base. Surface plain. Aperture biangular behind, rapidly widening, and round in front; outer lip simple, but rather thick; inner lip incrusted narrowly above, thickened over, and in front of the umbilicus. Umbilicus imperforate, a small angular ridge revolving from the umbilicus, nearly parallel with the margin of the inner lip.

Figure, natural size.

A rare shell, and entirely unlike any other in the formation. It seems to be most closely allied to the Oolitic genus *Euspira*, and altogether looks much more like a Jurassic than like a Cretaceous species.

CHEMNITZIA, d'Orb.

C. ZEBRA, n. s.

Pl. 35, Fig. 5.

SHELL elongate, slender-conical; spire high, whorls numerous, flattened, or very slightly convex on the sides; suture linear, impressed; body whorl flattened above, rounded below. Surface

plain, marked only by obsolete lines of growth, and ornamented by more or less sinuous, broken, irregular bands of color, longitudinally disposed, and sometimes entire, sometimes zigzag, branching, anastomosing and running out. Aperture subelliptical; outer lip sinuous; inner lip heavily incrustated.

Figure, natural size.

Easily recognized by its elongate form and nearly flat sides, and by the unusual circumstance of the retention of its color. Every specimen I have seen shows the colored pattern when the surface is wet, and most of them retain it so strongly as to show it even when dry.

Considerable confusion has arisen from a want of a clear understanding of the relations of d'Orbigny's genus *Chemnitzia* to *Turbonilla* of Risso. I believe Mr. Conrad was the first author to call attention to the fact, that good points of difference exist between the two. *Chemnitzia* is essentially a genus of comparatively large shells, all fossil, and which seem to be confined to Secondary rocks. They have thick shells, and are usually more or less angulated, with heavily incrustated inner lips. *Turbonilla* seems to have originated in the later Tertiaries, and attains its maximum development in the present seas. It contains only small shells, many of them being almost microscopic; they are usually thin, and the inner lip is little or not at all incrustated.

C. TEXANA, Roem., sp.

(*Scalaria Texana*, Roem.; Kreid. Tex., p. 39, pl. 4, fig. 11.)

A smaller shell than the preceding; characterized by rounded whorls, strong longitudinal ribs, and smaller revolving ribs. It seems to be a rather rare shell.

TYLOSTOMA, Sharpe. 1849.

Varigera, d'Orb. 1850.

T. MUTABILIS, n. s.

Pl. 35, Fig. 6, *a*, *b*, *c*.

SHELL very variable in shape, according to age. In the very young, subglobose or subovate; becoming more elongate in the adult, and compressed in the very old; apex elevated in average specimens; whorls seven to seven and a half, rounded on the sides, and usually more or less converging; suture deeply im-

pressed; transverse section subcircular to subelliptical, the two varices being nearly linear or obsolete in the young; and rough, prominent, and sometimes imbricating in the adult. Aperture elongate, acute behind, narrowly rounded in advance; outer lip simple or slightly thickened. In one very small specimen, the inner surface of the outer lip shows a minute crenulation, that I have been unable to detect in any other specimens of a large series. Inner lip slightly incrustated. Surface marked by lines of growth, and by the variable varices.

Figures 6 and 6 c, natural size. Figure 6, from an average specimen, 6 c, from an old shell, a top view to show the extreme form of the varices; 6 a and 6 b, front and top views, magnified, from a young shell, showing the internal crenulation and the symmetrical form.

One of the most common fossils at Arivechi.

ANCHURA, Conrad.

A. MONILIFERA, n. s.

Pl. 35, Fig. 7.

SHELL small, elongate, slender, fusiform; spire elevated; whorls numerous (six or seven?), rounded on the sides; body whorl regularly rounded, never angulated except in some instances near the origin of the large lip, where a faint carina starts and runs out in the middle of the lip. Surface ornamented by numerous, slightly flexuous, rounded ribs, with equal, concave interspaces, ribs and spaces alike crossed by about a dozen sharply elevated revolving threads. Outer lip unknown; the posterior angle of the mouth reaches almost to the penultimate suture, and both posteriorly and on the inner lip the aperture is bordered by a rather broad and somewhat flattened plate. Anterior canal unknown.

Although this shell is quite common; among perhaps fifty specimens, there was not a single one showing more of the outer lip, or of the canal, than is illustrated in the figure.

CERITHIUM, Brug.

C. MEXICANUM, n. s.

Pl. 35, Fig. 8.

SHELL elongate, slender; whorls numerous, rounded on the sides; suture linear, impressed. Surface marked by numerous, slightly curved longitudinal ribs, about twenty-five to a volution; these are crossed by five or six revolving ribs, which produce a small node at each crossing of the longitudinal ribs; between each pair are two or three minute revolving lines. On each volution there is one longitudinal rib, larger than the others, which seems to be a regular varix; these are irregularly placed, but on six whorls there are but six of these varices. They are not constant in size, and on the upper whorls, where the longitudinal ribs are less numerous, and proportionally larger, they assimilate them more nearly in appearance. Aperture broad, inner margin somewhat thickened and flattened.

Length of fragment, less anterior portion of aperture and several apical whorls, 1.1 inch.

Rare. But two or three specimens were found.

TURRITELLA, Lam.

T. SERIATIM-GRANULATA, Roem.

Under this head, among the Californian fossils, I have already given the synonymy of this species: see the enumeration (*ante*). The shell is very common, and is extremely variable in the details of its ornament, both in the number and in the arrangement of its ribs. Its apical angle is also somewhat variable.

ANGARIA, Bolt.

Delphinula, Lam.

A. CINGULATA, n. s.

Pl. 35, Fig. 9.

SHELL moderate in size, compact, whorls all in close contact; spire moderately elevated; upper whorls rounded; body whorl angulated, flattened above and on the sides, internally rounded; umbilicus broad, bordered by a sharp angle. Surface ornamented on the sides by large, oblique, longitudinal ribs or undulations, and on the top, sides, and bottom by numerous small revolving ribs; two, larger than the others, on the umbilical margin. Aperture large, subangulated, rounded in advance; inner lip sinuous.

Figure, natural size.

Rare. A single specimen in the collection of Mr. F. L. A. Pioche, of San Francisco. Well characterized by the whorls being all in close contact, by its subangular form, and by the obliquely undulated surface.

CINULIA, Gray.

Avellana, d' Orb.

C. RECTILABRUM, n. s.

Pl. 35, Fig. 10, 10 a.

SHELL small, compact, solid, subglobose; spire moderately elevated; whorls four, rounded; suture impressed. Surface marked by numerous large revolving ribs, in the interspaces of which can be sometimes detected a few obsolete punctations. Aperture elongate, narrow behind, rounded in advance; outer lip broad, thick, nearly straight; inner lip heavily incrustated, and bearing in advance two large, prominent folds; anterior margin of the mouth slightly emarginate.

Length, .4 inch; greatest width, .32 inch; lesser, .24 inch.

This species is allied to *C. Mathewsonii* of the California rocks, but differs in its less compressed form, the presence of but two folds in the mouth, placed in a different manner, and in the details of the sculpture.

PHOLADOMYA, Sowb.

P. SONORENSIS, n. s.

Pl. 36, Fig. 12.

SHELL elongate, suboval, very oblique, gibbous; beaks one-fourth of the length from the anterior end, which slopes nearly straight from the beaks to the middle, and is narrowly rounded or subtruncate below; cardinal margin concave; base irregularly convex, most prominent at, or a little posterior to the middle; posterior end regularly rounded. Surface marked by numerous, prominent, rounded, irregularly disposed, concentric ribs, crossed by four or five faint radiations, dividing the surface into as many obsolete planes. In some cases, the spaces between the radiating lines are faintly concave.

This shell is quite rare. I have seen but two or three specimens. It is not unlike *P. Oregonensis*, *supra* (Pl. 29, fig. 65), but the beaks are less anterior, the cardinal margin is more convex, the posterior end is more regularly rounded, and the concentric ribs are strong and prominent, instead of being nearly obsolete, as in that species.

TAPES, Megerle.

T. HILGARDI, Shum.

Pl. 36, Fig. 13.

(*Tapes Hilgardi*, Shumard; Trans. St. Louis Acad., 1860, p. 601.)

The present shell agrees with Dr. Shumard's description, and with a sketch which Mr. A. R. Roessler, late assistant in the Texas Survey, was kind enough to lend me, and which he made from the original type. Following Dr. Shumard, I refer the species to *Tapes*, though the hinge is not yet known, and I am confident that a thorough revision will be required among the numerous species referred to the various genera of *Veneridæ*, where generic distinctions are based so exclusively on the hinge, and where external form is of so little value. The recent

researches of Dr. Roemer and Mr. Conrad, have demonstrated the existence of several well-characterized and peculiar genera in the Cretaceous and Tertiary, among forms, until recently, referred to modern genera; and were our material more perfect, I am convinced that still further separations would be required. Palæontological conchology is shamefully in the rear, in the matter of generic division, as compared with that portion of the science which relates to living forms; and although palæontologists have a good excuse for their conservatism, in the very frequent total or partial absence of characters, yet when the material under consideration does retain all of its distinctive characters, they are too apt to allow their fear of radicalism, on the side of excessive subdivision, to drive them into the no less blameworthy fault of "old fogyism" on the other extreme.

It is in view of this failing of my co-laborers in the field of fossil conchology, that I have proposed so many new genera and sub-genera in the present work. I hardly hope that, for the present, all of them will be adopted, though they are certainly as distinct as the average of the modern genera, universally acknowledged by the students of the existing malacological fauna.

CARDIUM, Linn.

GRANOCARDIUM, *New S. Gen.*

I propose the present subdivision of *Cardium* to receive a well-marked, though small group of shells in the genus, characterized by a peculiar style of surface ornament. They seem to be peculiar to the upper portions of the Cretaceous formation, the oldest species with which I am acquainted being found in the upper Green Sand. The subgenus may be described as follows: Shell nearly equilateral, usually longer than wide; valves closed all round; surface ornamented by two series of radiating ribs, large ribs bearing spines, tubercles, or grains, and smaller ribs occupying the interspaces between the larger, and also granulate.

This is one of the most highly ornamented groups in the genus, and is represented in Europe by *C. productum*, Sby., *C. Moutonianum*, d'Orb, and *C. Carolinum*, d'Orb, and in America by *C. Tippanum*, Conrad, and the present species. *Tippanum* is from the equivalent of the upper chalk, *sabulosum* is on the horizon of the lower chalk, and the three European species quoted, are from the upper Green Sand, (*Cenomanien*, d'Orb.).

The ornaments of the present species are more minute than on any of the others in the subgenus, with which I am acquainted.

C. (G.) SABULOSUM, n. s.

Pl. 36, Fig. 14

SHELL convex, nearly equilateral, rounded, subquadrate; beaks central, slightly pointed in advance; umbones very prominent; cardinal margins equally and very slightly sloping; anterior end and base regularly convex; posterior end rounded, subtruncate. Surface marked by from twenty to thirty radiating ribs bearing small, elongate tubercles; between these ribs are broad, flat, interspaces, each one with two or three fine, linear ribs, minutely granulate.

Figure, natural size; transverse diameter, 1.15 inch.

C. (PROTOCARDIUM) GRANULIFERUM, n. s.

Pl. 36, Fig. 15.

SHELL large, thin, subquadrate, subcompressed. Beaks central, strongly pointed in advance, umbones moderate; cardinal margins sloping; base broadly and regularly rounded; anterior end rounded, sometimes rounded subtruncate; posterior end obliquely truncate. Surface marked by from fifteen to eighteen radiating ribs, which occupy the posterior face to beyond the posterior basal angle; some of these ribs, those nearest the outer margin of the shell, carry small granulations, irregularly disposed along their length. The remainder of the surface is covered by irregular lines of growth.

Figure, natural size of an average specimen. One fine example before me measures length and width each, 3 inches, diameter of two valves, 1.8 inch. A small specimen, less than an inch in length, has the beaks much less prominent than in the figure, the cardinal margins much more sloping, and the whole outline below forming a regular curve. On comparing the specimens with the figures of *C. (P.) multistriatum*, Shum., in Emory's Report, pl. 6, fig. 4 a-c, the present form seems to be more truncated posteriorly, and I can detect no indications of the granules on the radiating ribs either in the figures or in the descriptions of Conrad or Shumard. By comparing with some very imperfect specimens of Shumard's

species, I find a great difference in the convexity; that form having a far greater transverse diameter. I have never been so fortunate as to see a good example of the Texan shell; and have been obliged to rely on the descriptions and figures in Marcy's and Emory's Reports, almost entirely. It is not impossible that the two species may prove identical, though I hardly think it possible that, had it existed, so marked a character as the granules on the ribs would have been overlooked by two such students as Conrad and Shumard.

CARDITA, Brug.

?C. ALTICOSTA, n. s.

Pl. 36, Fig. 16.

SHELL oblique, subtrigonal, gibbous; beaks prominent, subterminal; anterior end deeply excavated under the beaks, broadly and prominently rounded below; cardinal margin rapidly sloping, nearly straight; posterior end narrow, rounded; base regularly convex. Surface marked by about twenty-five high, narrow ribs with concave interspaces. In some cases these ribs are smooth, in others they are crossed by lines of growth, developed into imbricating plates. Lunule small, broad, cordate.

Length, .8 to .9 inch.

Common. Although I have been unable to expose the hinge of this shell, I have very little doubt of the correctness of the generic reference. Externally it possesses every character of *Cardita*. The shell is invariably crystalline, and the matrix is a tough amorphous limestone, which never yields under the chisel until the shell is completely shattered; I have, in consequence, been obliged to trust to external resemblances, rather than to the more certain evidence furnished by the internal characters.

PINNA, Linn.

P. SP. INDET.

Fragments of a long slender *Pinna* are not rare in the collection. They indicate a species not unlike *P. Brewerii* nob., but are in too fragmentary a condition to warrant description.

TRIGONIA, Brug.

T. MOOREANA, Gabb.

(*T. crenulata*, Roem. (*not Lam.*); Kreid. Tex., p. 51, pl. 7, fig. 6.)

(*T. Mooreana*, Gabb; Synopsis Cret. Moll., p. 176.)

SHELL elongate subtrigonal, beaks small, terminal, incurved; anterior end slightly convex, rapidly sloping backwards; base forming a regular curve, continuous with the anterior margin; posterior cardinal margin broadly and slightly concave; posterior end unknown. Surface ornamented by about twenty-five moderately large and slightly sinuous ribs, very slightly crenulated, with broad concave interspaces. These ribs become obsolete on the border of the corselet, or cross it transversely as fine lines, continuing across the central area as sharply defined, linear ribs, in a transverse direction, slightly curved forwards at their extremities. Corselet broad, nearly flat, with a narrow border, marked by a deep longitudinal groove.

Length of a broken specimen, less a portion of the posterior end, 2.4 inches, probable total length, 2.8 inches; width, 1.5 inch, height of single valve, .9 inch.

Not rare at Arivechi.

The present species belongs to a large group in the genus, all of which are more or less closely allied. It can be distinguished from *T. crenulata*, its nearest ally, and to which Dr. Roemer referred it, by its more slender form, less prominent base, less strongly crenulated ribs, and by the character of the corselet. In Lamarck's species, that area is comparatively smaller, and is bordered by a wide margin, over which the ribs cross very obliquely backwards from the beak, afterwards crossing the area itself almost transversely or obliquely forward, though in a less degree than on the margin. In our species, the border of the area is narrow and deeply grooved, and the linear ribs are obsolete, except near the beaks, where they are transverse, instead of having the marked obliquity seen in *crenulata*.

It differs from *T. Emoryi*, Con., in being more elongate, in having a much narrower corselet, and in other minor details. From *T. Evansana*, Meek, it can be distinguished by its less prominent base, more retreating anterior end, the greater number of its ribs, and by the entirely different direction of the lines on the corselet.

REMONDIA, *N. Gen.*

SHELL compressed, elongate subquadrate, closed at the extremities (or perhaps slightly gaping posteriorly). Ligament very short, external. Hinge composed of three radiating cardinal teeth in each valve, and a long posterior tooth in the left, with a corresponding tooth in the right. The middle cardinal of the left valve is transversely striate, as in *Trigonia*, and is slightly grooved on its face, the anterior is linear and smooth, and the posterior is also smooth, at least on its posterior face. The posterior lateral, and its corresponding cavity, are irregularly rugose. In the right valve, the anterior tooth is as large as the middle, the posterior is linear; further details unknown.

This genus is evidently closely allied to *Trigonia*, its quadrate form not being unlike many of the species of that genus, and the transversely striate teeth showing a marked resemblance. I am unable to say, even with a large series before me, whether the posterior end was closed or not. In every case the extremity is more or less broken, and from the appearance of the most perfect specimens, it is not improbable that there may have been a slight gaping of the lower portion of the posterior margin.

In giving the above name to this genus, I take great pleasure in at least fulfilling a promise, made three or four years ago, of dedicating it to my old friend Auguste Rémond de Corbigneau, who was cut off almost at the commencement of a career, that promised more than ordinarily brilliant results, and whose untimely death was mourned by all who knew him.

R. FURCATA, n. s.

Pl. 36, Fig. 17, 17 a.

SHELL thick, elongate, subquadrate, compressed; beaks small, prominent, placed not quite a third of the length from the anterior end, which is narrowly rounded in the middle and retreats rapidly, nearly straight above, and convex below; cardinal margin very slightly concave, nearly parallel with the base; base faintly sinuous, broadly convex in advance, straight to concave posteriorly; posterior end concave in the middle, prolonged into two blunt

points, the lower a little the longest. Adjoining the hinge line, both in advance of and behind the beaks, the surface is concavely truncated, making two plain areas with converging sides, bordered by sharp angles, corresponding in advance to a lunule, and posteriorly to the corselet of a *Trigonia*. A strongly marked umbonal ridge runs from the beaks to the posterior basal angle, above which the surface is concave, and in front of which it is very slightly convex. Surface marked by very irregular concentric ridges, less distinct towards the base, and corresponding in direction with the lines of growth.

Length (restored), 2.5 inches; width, 1.3 inch; diameter of two valves, .65 inch.

CUCULLÆA, Lam.

C. INERMIS, n. s.

Pl. 36, Fig. 18.

SHELL large, thick, subquadrate, very convex, variable in outline. Beaks large, incurved, distant, variable in position, placed sometimes but slightly in advance of the middle, sometimes not more than a third of the length from the anterior end. Anterior end nearly straight above, rounding into the base below; posterior end very variable, more or less produced, sloping above, narrowly rounded below; base nearly straight or slightly convex; area broad, from two-thirds to three-fourths of the length of the shell; umbonal ridge rounded, posterior to which the surface is nearly flat, and almost at a right angle to the portion in advance. Surface marked only by lines of growth; in one unusually perfect specimen, minute radiating lines can be detected near the beaks, by the aid of a glass.

Dimensions of three specimens: length, 3.0 inches; width, 2.2 inches; diameter of two valves, 2.0 inches. Length, 2.5 inches; width, 2.1 inches; diameter of two valves, 2.0 inches. Length, 1.9 inch; width, 1.5 inch; diameter of two valves, 1.3 inch.

This shell is not unlike *C. truncata*, of the California rocks, but is easily dis-

tinguished by its more anterior beaks, more rounded umbones, shorter hinge, less prominent anterior end, and straighter base. It is larger than *C. Nebrascensis*, and its more square form will distinguish it.

GRYPHÆA, Lam.

Perhaps no fossil in the Cretaceous formation of North America has been the subject of more discussion, or has been more misunderstood than *Gryphæa Pitcherii*. One of the principal reasons for this, is the fact that Dr. Morton described the species from a very small specimen, and gave, in his "Synopsis," but a single figure, which was not over characteristic. Dr. Roemer, after studying the fossils of Texas, visited the Museum of the Philadelphia Academy to study Morton's types, but did not succeed in finding the original specimen of this species, it having been carelessly thrown aside, in a drawer full of duplicates and worthless fragments, from which I had the good fortune to disinter it in 1860 or 1861, after years of concealment. Failing to obtain more reliable information than that furnished by Morton's short description and only passable figure, Dr. Roemer applied the name to a form very common in Texas, but which, as will be seen below, I believe to be distinct from the true *Pitcherii*.

In Emory's report of the Mexican Boundary Survey, Mr. Conrad indicated a variety with strongly carinated and deflected beaks, under the name of *G. Pitcherii* var. *navia*. This is now universally considered by American Palæontologists as a distinct species.

Professor Marcou, having advanced the theory of the Jurassic age of a large portion of the rocks of the Southwest, and being inclined to bolster it up by forcing evidence to its support, in 1855, in the Bulletin of the Geological Society of France, and again in his Geology of North America, selected the "variety" *navia* as Morton's, so called, typical form, and said the true *Pitcherii* was merely a variety of the Jurassic *dilatata*, calling it the "variety *Tucumcarii*." In the latter publication he gives excellent figures of *navia* under the name of *Pitcherii*, and illustrates both the more common and the most dilated form of the true *Pitcherii*, under the name of "var. *Tucumcarii*." My attention has been constantly directed to the question for the last eight or nine years, and I have made it a point to study critically, all the reputed specimens of *Pitcherii*, and of the allied forms that have come within my reach, and have arrived at the conclusion that there have been three well-marked and distinct species included under this name, as follows:

G. PITCHERII, Morton.

(*Gryphæa Pitcherii*, Morton; Synopsis, p. 55, pl. 15, fig. 9.)

(*G. Pitcherii*, Con.; Emory's Report, p. 155, pl. 21, fig. 3 a, b (exclus. c, d).)

(*Id.*, Con.; *loc. cit.*, pl. 10, fig. 2.)

(*Ostrea vesicularis*, d'Orb. (not Lam.); Prod. Pal. Strat., Vol. 2, p. 256, Etage 22, No. 925.)

(*G. dilatata*, var. *Tucumcarii*, Marcou; Bull. Soc. Géol. de France, Vol. xi, pl. 21, fig. 3.)

(*Id.*, Marcou; Geol. N. A., p. 43, pl. 4, fig. 1, *a*, *b*, 2, 3.)

(*G. Pitcherii*, Gabb; see remarks Proc. Phil. Acad., 1861, p. 22.)

SHELL moderately thick, more or less rounded trigonal, expanded. Lower valve variably and unequally bilobate, the large lobe forming about two-thirds of the bulk of the valve, separated from the smaller lobe by a radiating depression, most strongly marked towards the base. Beaks small, incurved, or very slightly deflected towards the side of the small lobe; umbones large, prominent, and rounded; no umbonal ridge. Sides sloping nearly straight, or slightly convex, downwards from the hinge margin, unequal, the side of the small lobe being always the most prominent. Basal margin more or less strongly sinuous. Hinge triangular, short, broad, and straight. Upper valve nearly flat, or a little convex near its straightest margin, caused by a greater thickness at that point; rounded, trigonal to subovate, or almost subcircular. Surface smooth or slightly imbricated.

This description is based principally on Dr. Morton's original specimens, somewhat amplified by the assistance of additional material.

G. NAVIA, Con.

(*Gryphæa Pitcherii*, var. *navia*, Con.; Emory's Report, Mexican Boundary, p. 155, pl. 7, fig. 3, *c*, *d* (exclus. *a*, *b*).)

(*G. Pitcherii*, Marcou (not Morton); Geol. N. A., p. 38, pl. 4, fig. 5, *a*, *b*, fig. 6.)

(*G. navia*, Gabb; Proc. Phil. Acad., 1861, p. 22.)

SHELL very thick, elongate, narrow subtrigonal. Lower valve thick, very indistinctly or not at all bilobate; beaks acute, prominent, flattened laterally, and deflected entirely beyond the left hand margin; umbones prominent, angulated, a sharp umbonal ridge running from the beak to the basal margin; sometimes a slightly marked, rounded ridge occupies the position of the smaller

lobe of *Pitcherii*. Base entire; sides sloping from the hinge line to the base at nearly equal angles, the right side a little convex, the left about equally concave. Surface more or less squamose, sometimes a series of very rough imbrications on the umbonal ridge. Hinge long, narrow, and curved laterally with the deflection of the beak. Upper valve small, thick, narrow, flat, and oblique.

For the resemblances and differences between the three forms, see notes following the description of the succeeding species.

G. MUCRONATA, Gabb.

(*G. Pitcherii*, Roem. (not Morton); Kreid. Tex., p. 73, pl. 9, fig. 1.)

(*G. Pitcherii*, Schiel? (not Morton); Pacific Railroad Report, Vol. 2, p. 108, pl. 3, fig. 9.)

SHELL long, narrow, subtrigonal, very thick. Lower valve strongly bicarinate by two radiating ridges, one running from the umbones, the other near the opposite margin, dividing the surface rudely into three portions, two marginal planes and an intermediate one, often concave. Beaks very prominent, produced, median and strongly incurved; umbones very prominent and rounded. Hinge long, narrow, and straight. Sides nearly equal, diverging equally at a narrow angle; base slightly convex, entire. Upper valve long, narrow, thick, and straight. Surface marked by subsquamose lines of growth.

The differences between these three species are as follows: *G. Pitcherii* is dilated and very distinctly bilobate, the beaks are small and incurved, and the umbones are broadly rounded. *G. navia* is narrow triangular, the beaks are deflected excessively, and the umbonal ridge is acute-angular, sometimes not being more than forty to forty-five degrees. The hinge is also deflected. *G. mucronata* is also narrow, but the beaks, which are very long and incurved, in some cases into a prominent hook, are placed exactly in the median line, and the umbone and umbonal ridges are rounded, never even subangular.

Mucronata and *Pitcherii* agree in the median beaks, but differ in form. *Navia* and *mucronata* have the narrow trigonal form, but differ in the size, shape, and positions of the beaks. There is less resemblance between these latter on the one side, and *Pitcherii* on the other, than there is between some of the varieties of

Pitcherii and *vesicularis*. At the same time the beaks will distinguish them between themselves.

G. mucronata occurs abundantly among the Mexican fossils.

EXOGYRA, Say.

E. PLICATA, Lam., sp.

Pl. 36, Fig. 19, 19 *a*.

- (*Gryphæa plicata*, Lam.; 1819, An. S. Vert., Vol. 6, p. 199.)
 (*Exogyra plicata*, Goldf.; Petr. Germ., Vol. 2, p. 37, pl. 87, fig. 5.)
 (*E. plicata*, Roem.; Kreid., p. 48.)
 (*E. flabellata*, Goldf.; Petr. Germ., Vol. 2, p. 38, pl. 87, fig. 6 (young).)
 (*Ostrea flabellata*, d'Orb.; Pal. Fr., Vol. 3, p. 717, pl. 475.)
 (*E. harpa*, Goldf.; Petr. Germ., Vol. 2, p. 38, pl. 87, fig. 7.)
 (*Gryphæa harpa*, Fbs.; Quart. Jour. Geol. Soc., 1844, p. 250, pl. 3, fig. 12.)
 (*Ostrea Matheroniana*, d'Orb.; Pal. Fr., Vol. 3, p. 737, pl. 485.)
 (*E. Matheroniana*, Con.; Emory's Rep., p. 154, pl. 8, fig. 11.)
 (*E. Boussingaultii*, d'Orb.; Foss. de Col., p. 57, pl. 3, fig. 10; pl. 5, fig. 8, 9.)
 (*E. Boussingaultii*, d'Orb.; Am. Merid., p. 91, pl. 18, fig. 20.)
 (*Ostrea Boussingaultii*, d'Orb.; Pal. Fr., Vol. 3, p. 702, pl. 468.)
 (*E. subplicata*, Roem.; Ool. Nach., tab. 18, fig. 17.)
 (*E. spinosa*, Math.; Cat., p. 192, pl. 32, fig. 6, 7.)
 (*E. Texana*, Roem.; Kreid. Tex., p. 69, pl. 10, fig. 1 *a, b, c, d*.)
 (*E. Texana*, Shum.; Marcy's Rep., Red. R., p. 205, pl. 5, fig. 1, 2.)

Quite common in Texas and at Arivechi, as well as at all or most of the intermediate localities. I cannot believe that, in an oyster, the number or size of the plications, within reasonable limits, can be depended upon as of specific value, and it is on these alone that the above long list of names has been proposed.

OSTREA, Linn.

O. SP. INDET.

A small, thin oyster occurs, incrusting many of the larger fossils, and growing in clusters. It is rarely more than an inch or an inch and a quarter long, is closely attached by the whole lower surface, and, where not crowded out of shape, is irregularly trigonal, a little oblique, and narrows regularly towards the beaks.

RADIATA.

PYRINA, Desmoul.

P. PARRYI, Hall.

(*Pyrina Parryi*, Hall; Emory's Rep., p. 144, pl. 1, fig. 1 *a-d*.)

Rare; but three or four specimens were found.

CYPHOSOMA, Agas.

C. TEXANUM, Roem.

(*Diadema Texana*, F. Roem.; Texas, p. 392.)

(*Cyphosoma Texanum*, Roem.; Kreid. Tex., p. 82, pl. 10, fig. 6.)

(*Id.*, Hall; Emory's Report, p. 145, pl. 1, fig. 3 *a-c*.)

More common than the preceding.

TURBINOLIA, Lam.

? T. TEXANA, Con.

(*Turbinolia Texana*, Con.; Emory's Report, p. 144, pl. 2, fig. 3 *a, b*.)

Very common.

UNDETERMINED.

Two or three species of incrusting tubes occur in the collection, perhaps all *Serpulidæ*. They are all, with one exception, so weathered that all distinctive characters are obliterated. The exceptional case is the one of which a somewhat magnified view is given on Pl. 36, Fig. 11. It may be a *Serpula*, or not impossibly one of the *Vermetidæ*. It is closely attached by its lower surface, which is expanded laterally into a subsquamose plate; the upper surface is longitudinally convex, with a slight ridge or offset on each side, and is transversely striate or rugose. The aperture is transversely subelliptical in section. This form is very rare. I have seen but a single specimen.

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PLATE I.

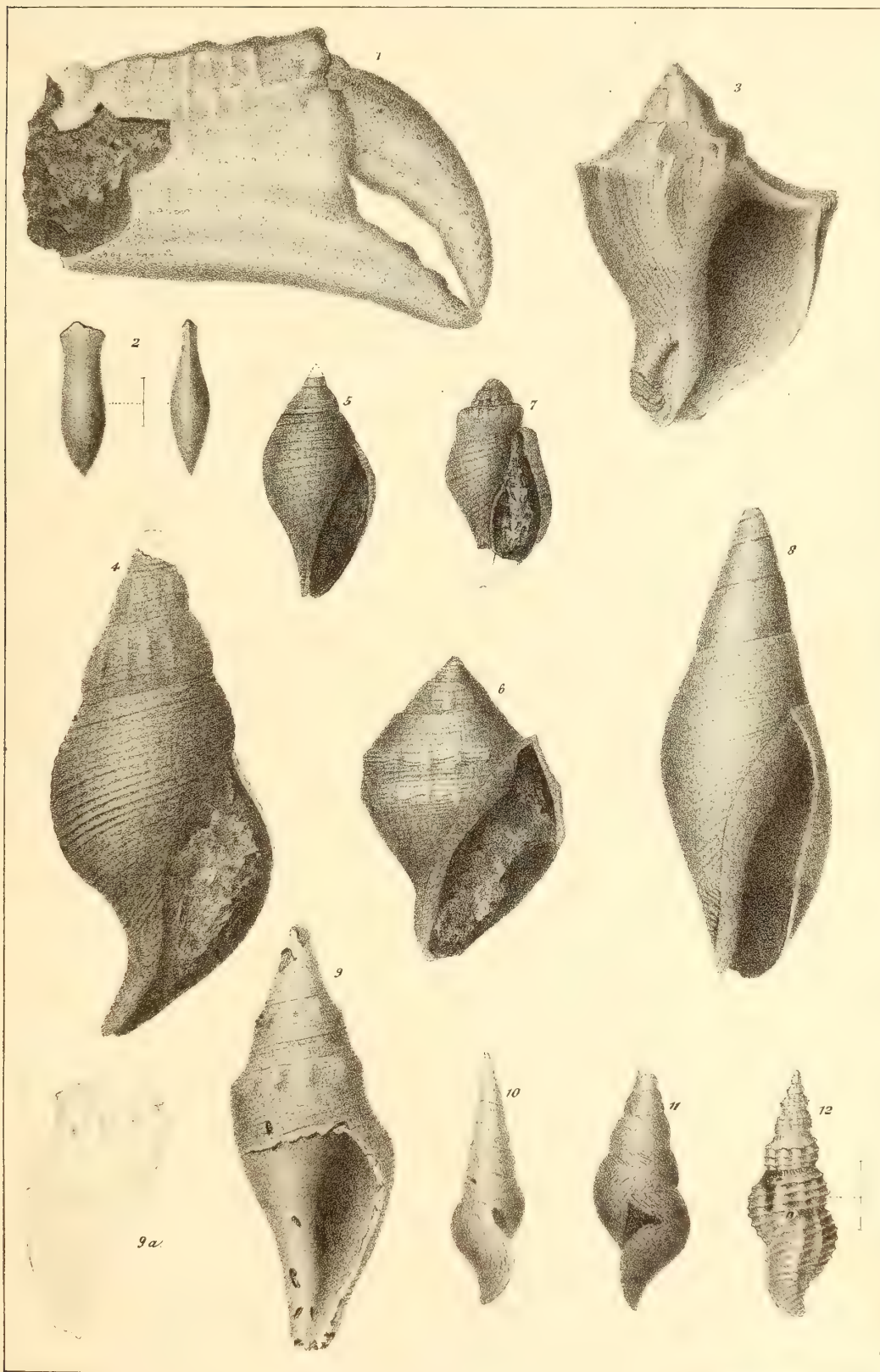
	PAGE
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PLATE 1



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PLATE 2

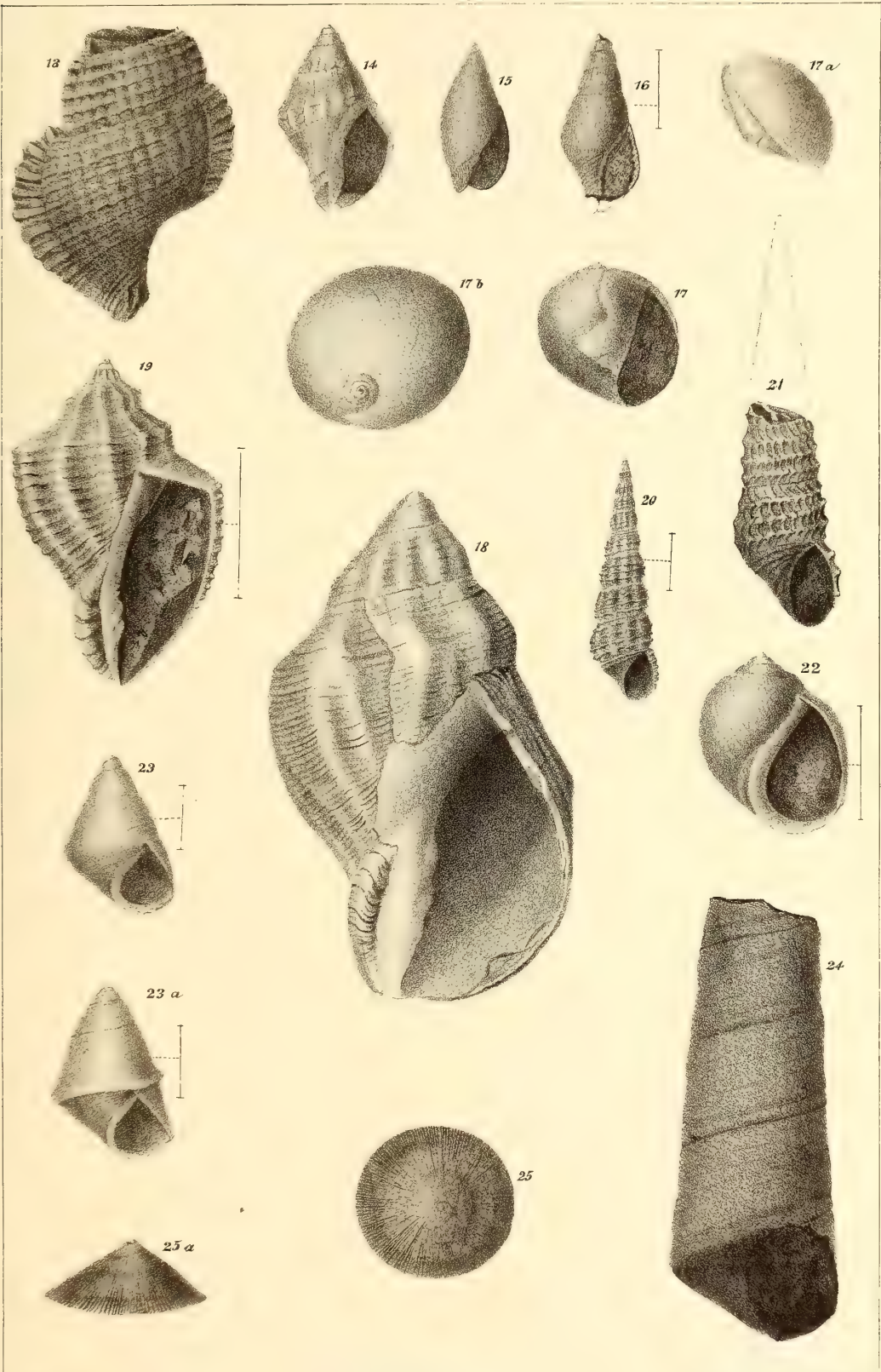


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PLATE 13

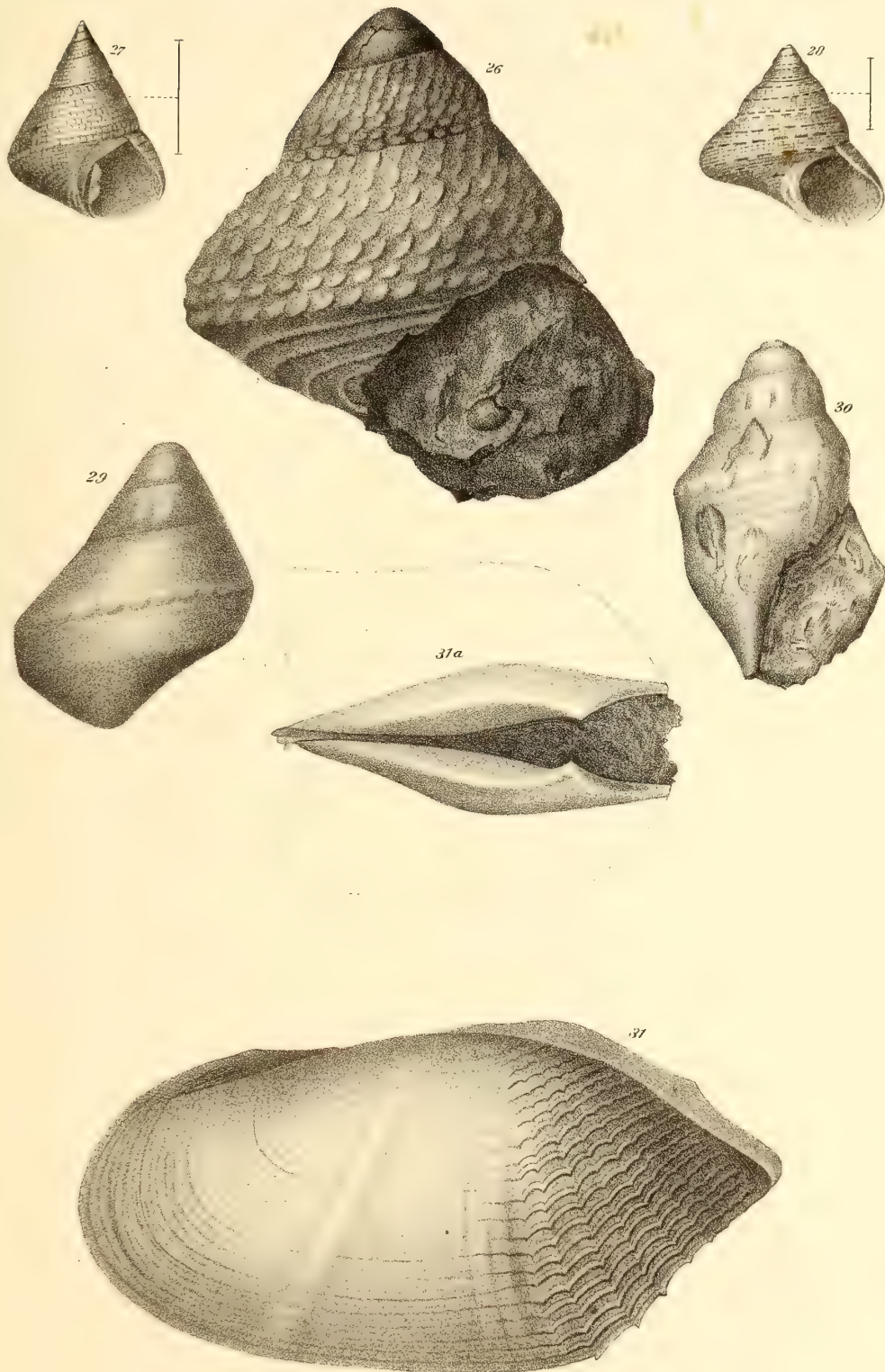




PLATE IV.

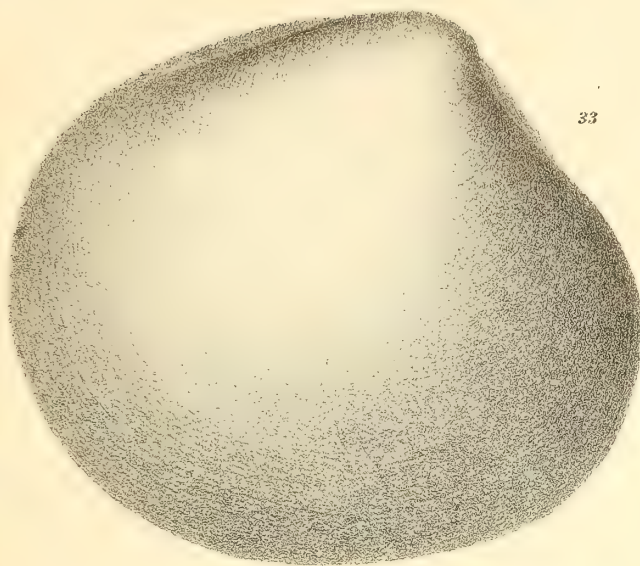
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PLATE I



34a

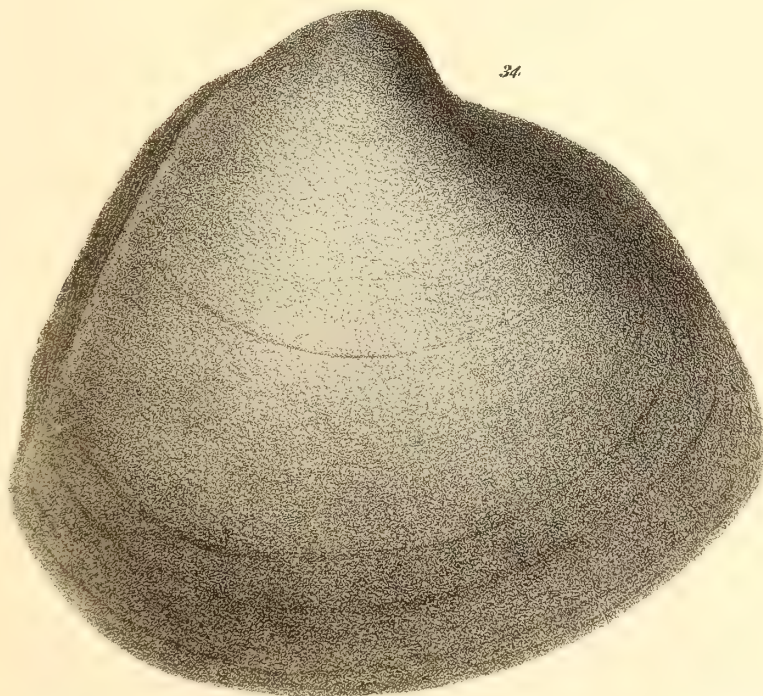
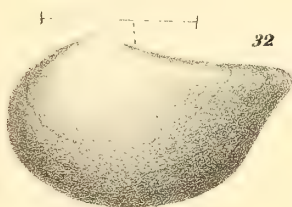


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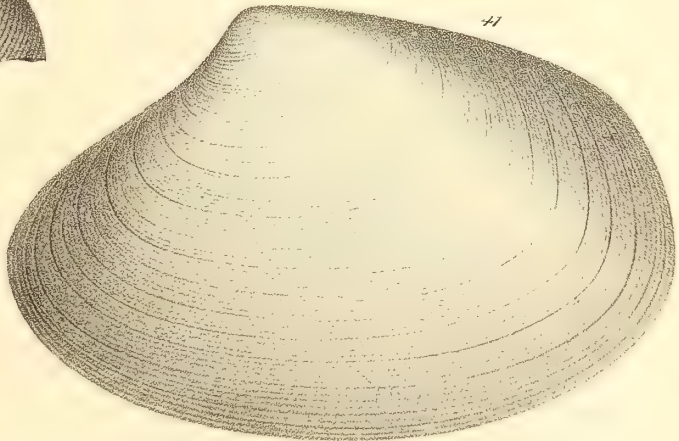
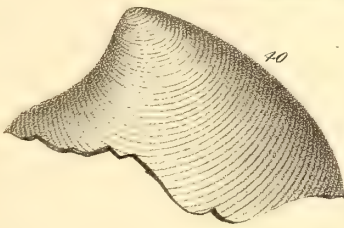
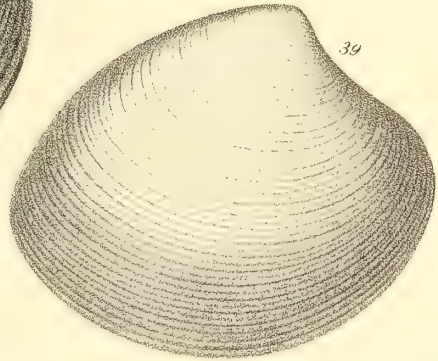
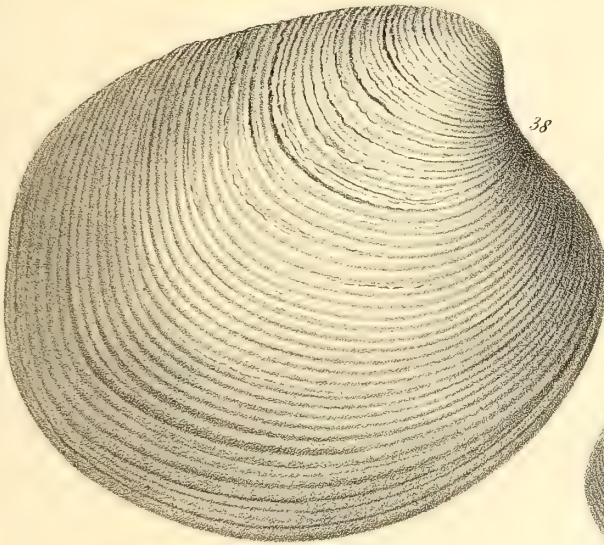
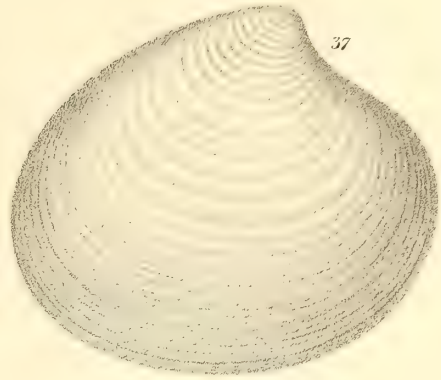
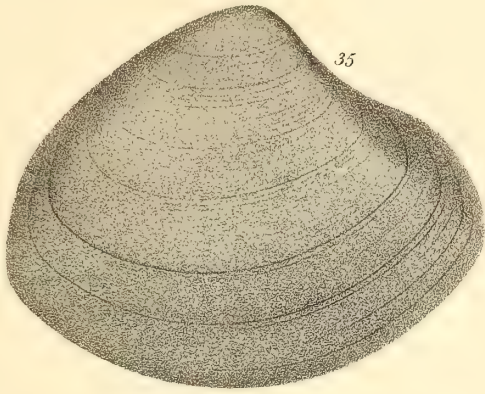


PLATE VI.

17. *Side view to show the prominence of the enormous lateral teeth.*
17 A. *Hinge of the two valves.*
17 B. *Half view.*

PLATE VI.

Fig. 47. PSEUDOCARDIUM GABBII. Natural size.

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21

47 *a.* End view.

47 *b. c.* Hinge of the two valves.

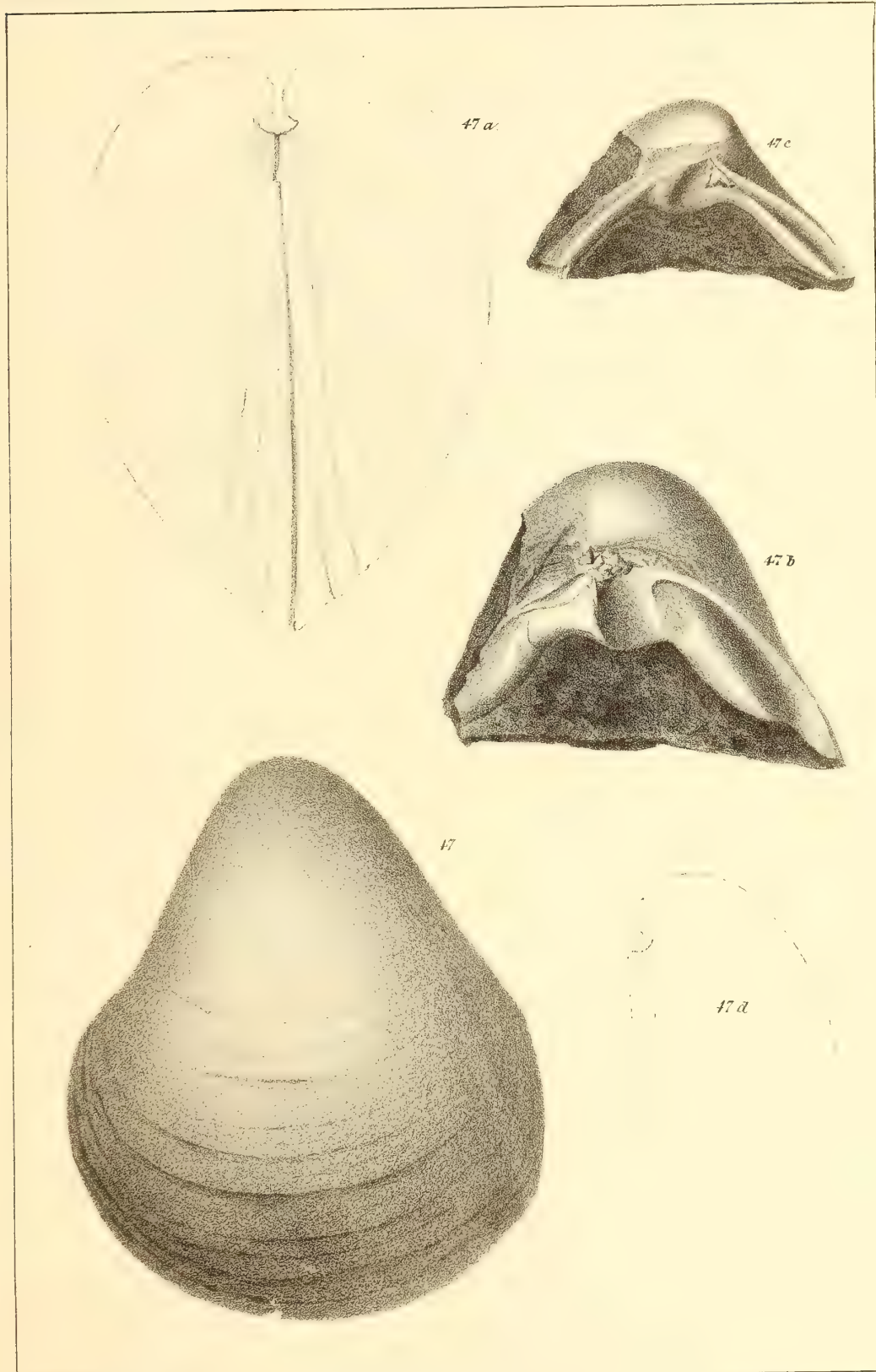
47 *d.* Side view to show the prominence of the enormous lateral teeth.

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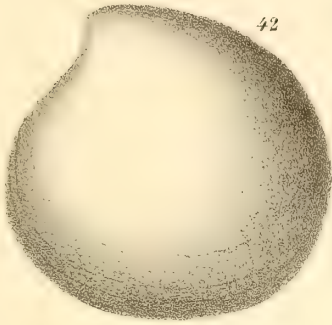
PLATE 6.



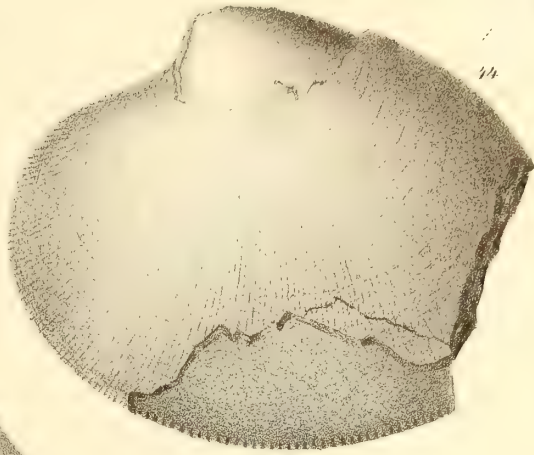


P L A T E V I I .

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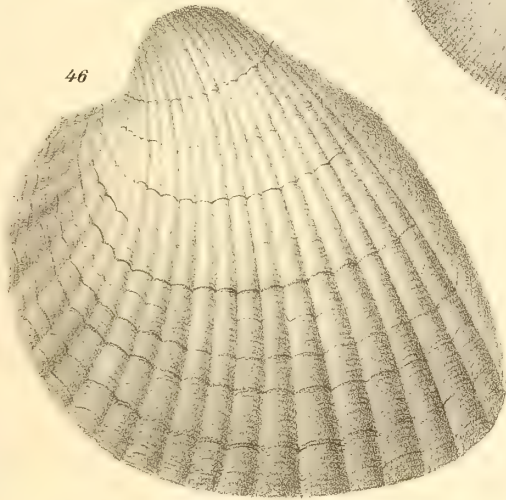


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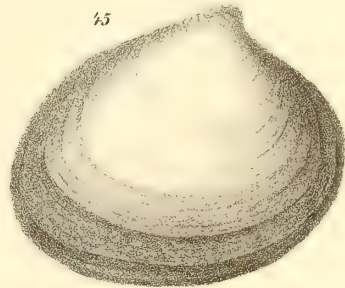


44 a

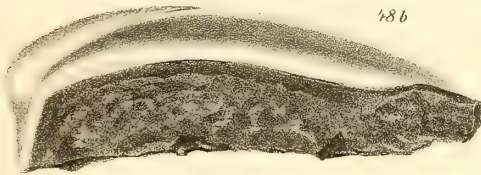
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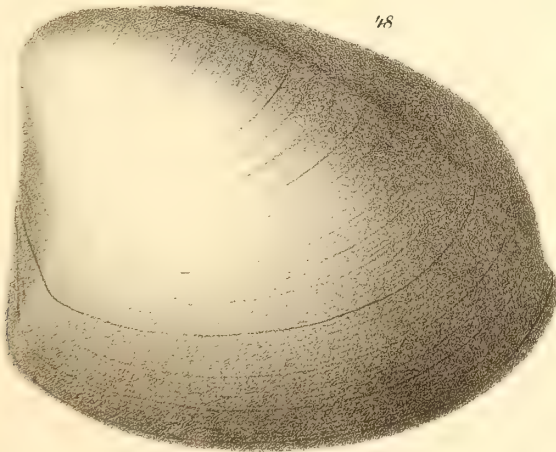
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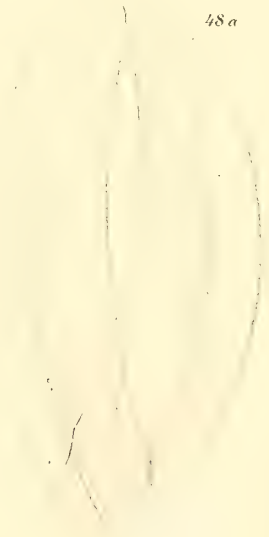
45



48 b



48



48 a

PLATE VIII.

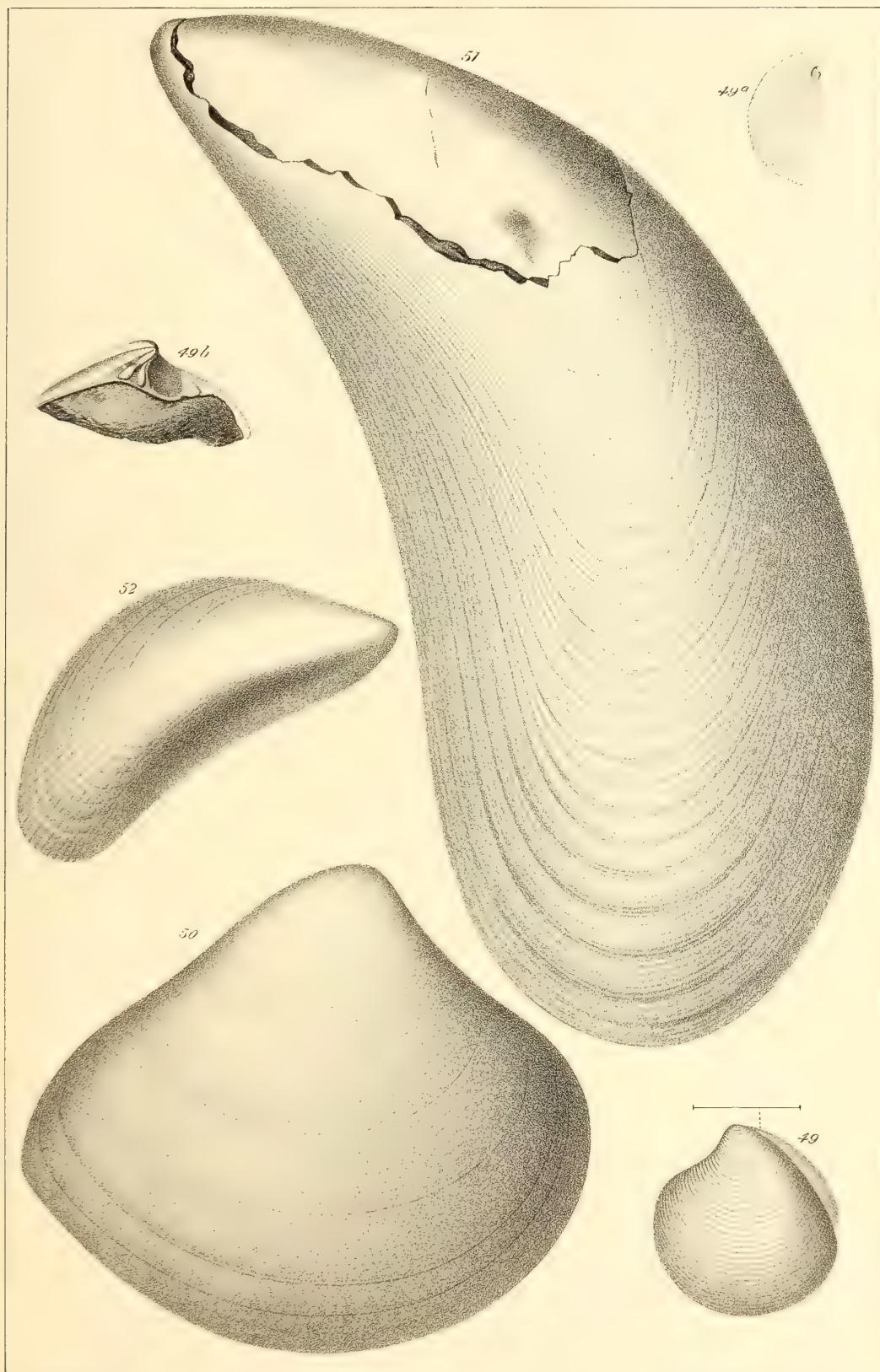
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PALEONTOLOGY, VOL. II.

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PLATE B.



A. M. Gabb del.

T. C. Smith lith. Philadelp.



PLATE IX.

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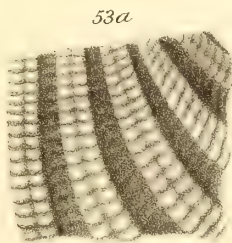
PALAEONTOLOGY, VOL. II.

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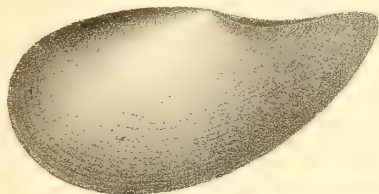
PLATE D.



53



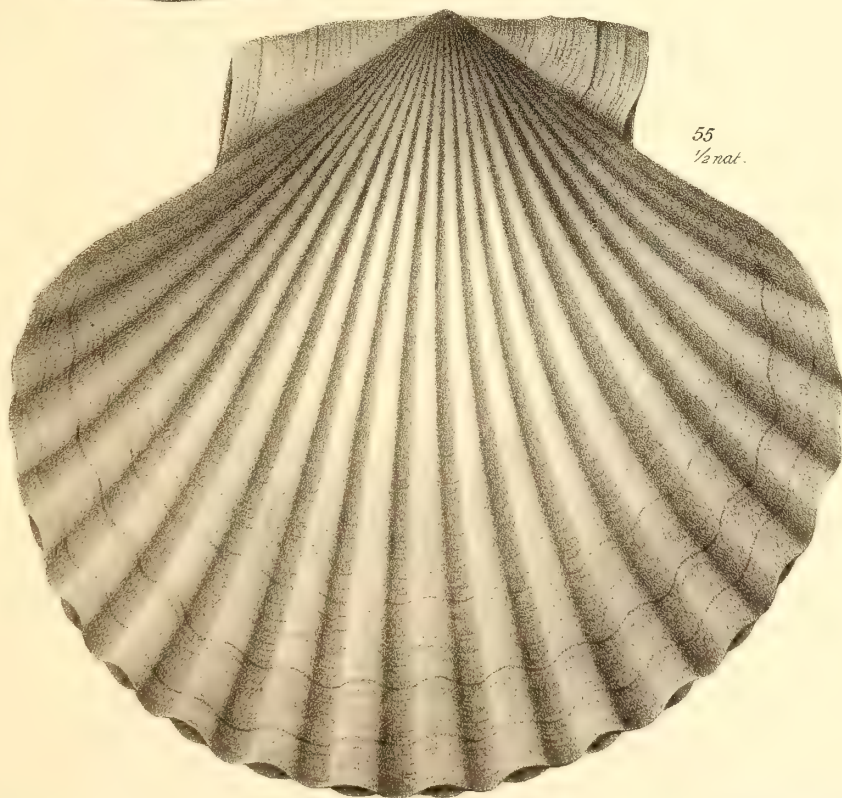
53a



54



55a
1/2 nat.



55
1/2 nat.



Information and contact details for the library are provided below.



PLATE X.

Fig. 56.	PECTEN VEATCHII. Natural size.	PAGE 32
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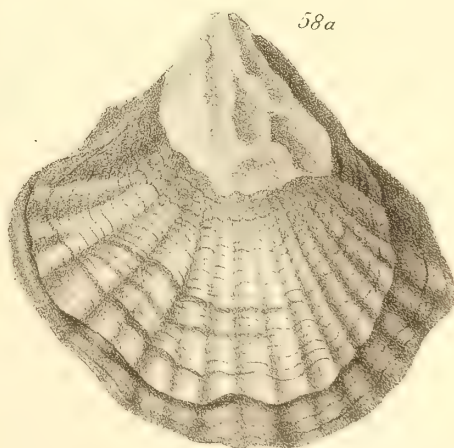
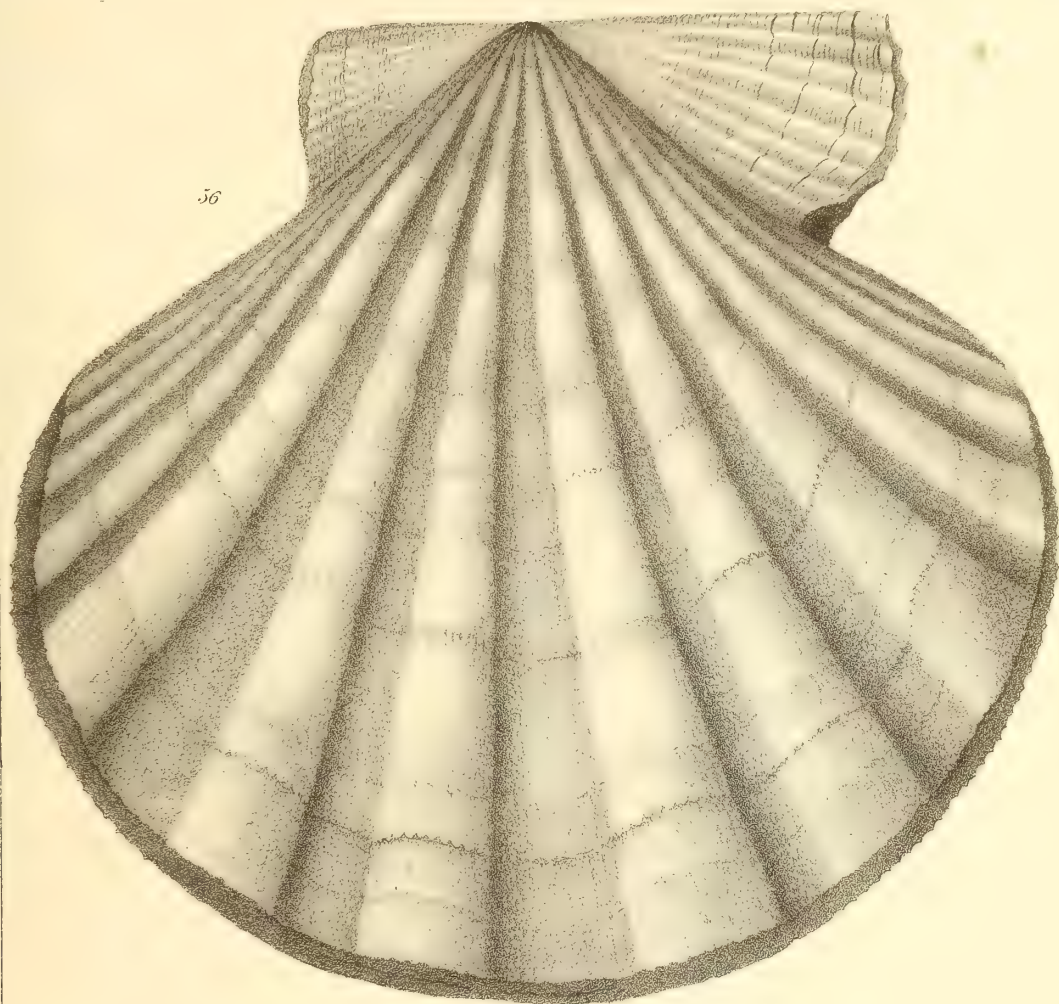
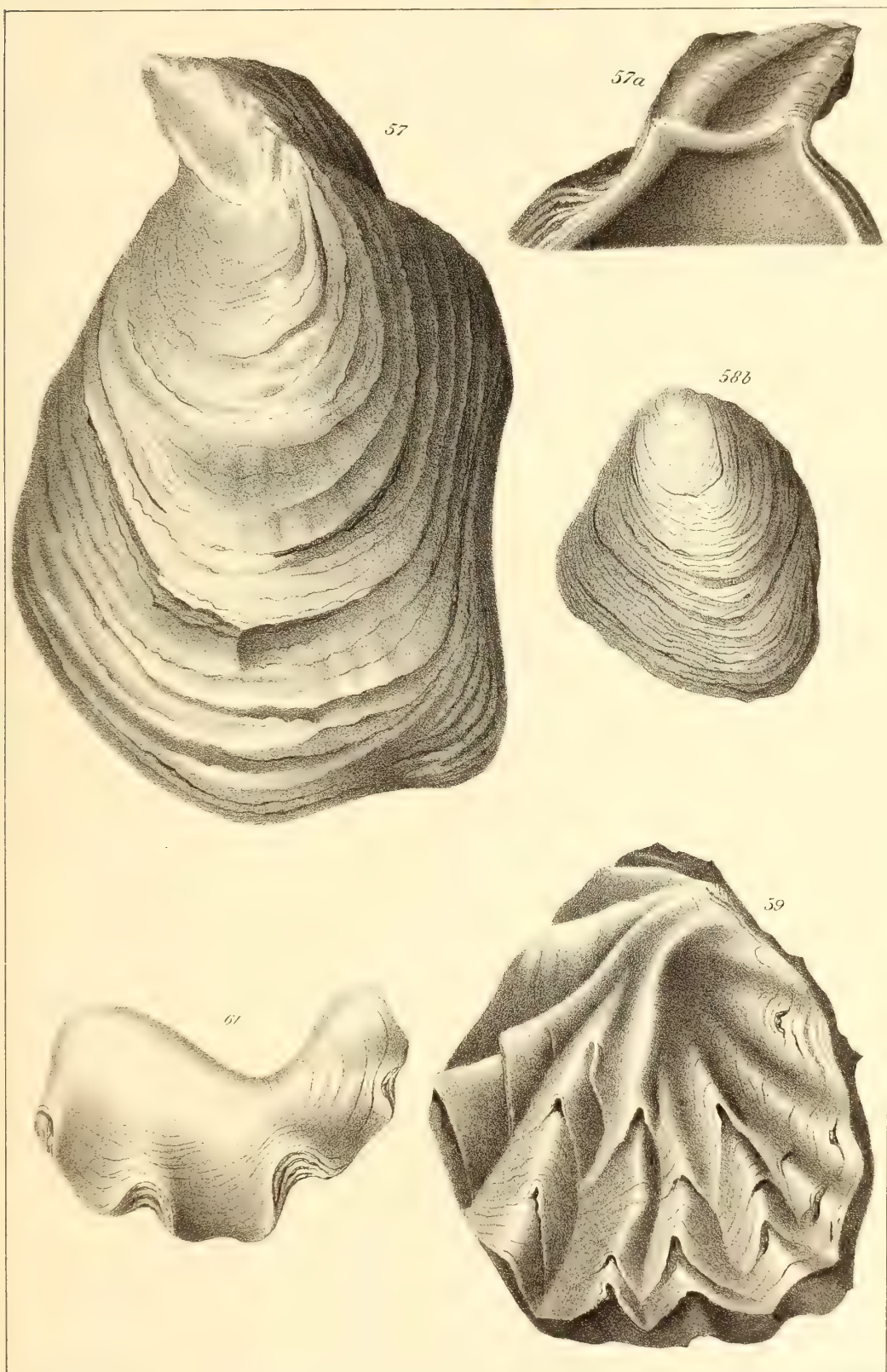


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<p style="margin: 0;">NOTE.—This species was originally supposed to be Tertiary; but investigations since the text was printed, develop the fact that it belongs to the Lower Cretaceous.</p>	
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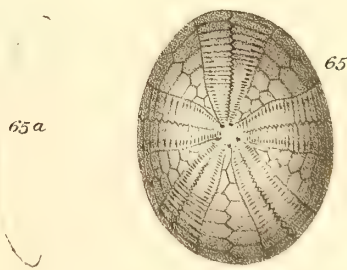
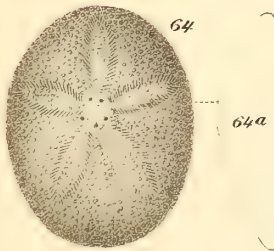
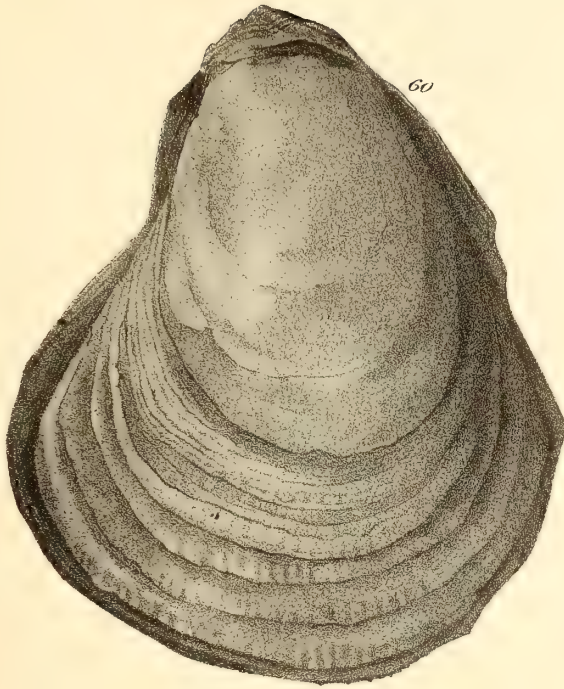


PLATE XIII.

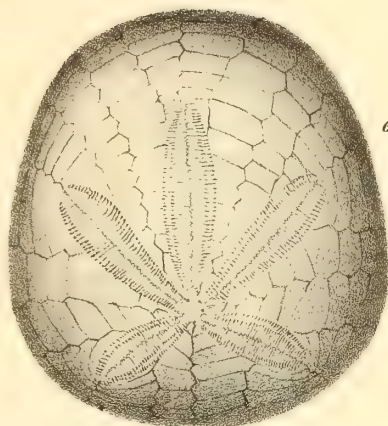
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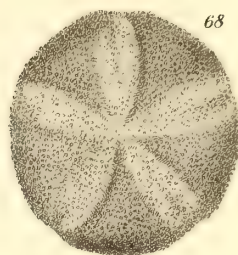
PALEONTOLOGY, VOL. II.

(Tertiary)

PLATE 13.



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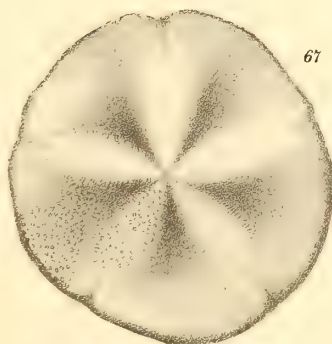
68

68 a

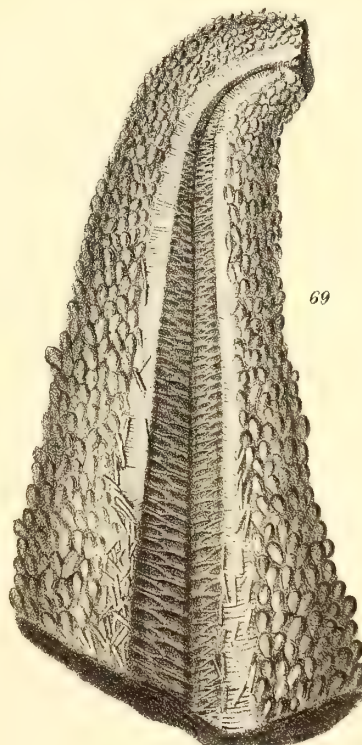


66 a

67 a



67



69





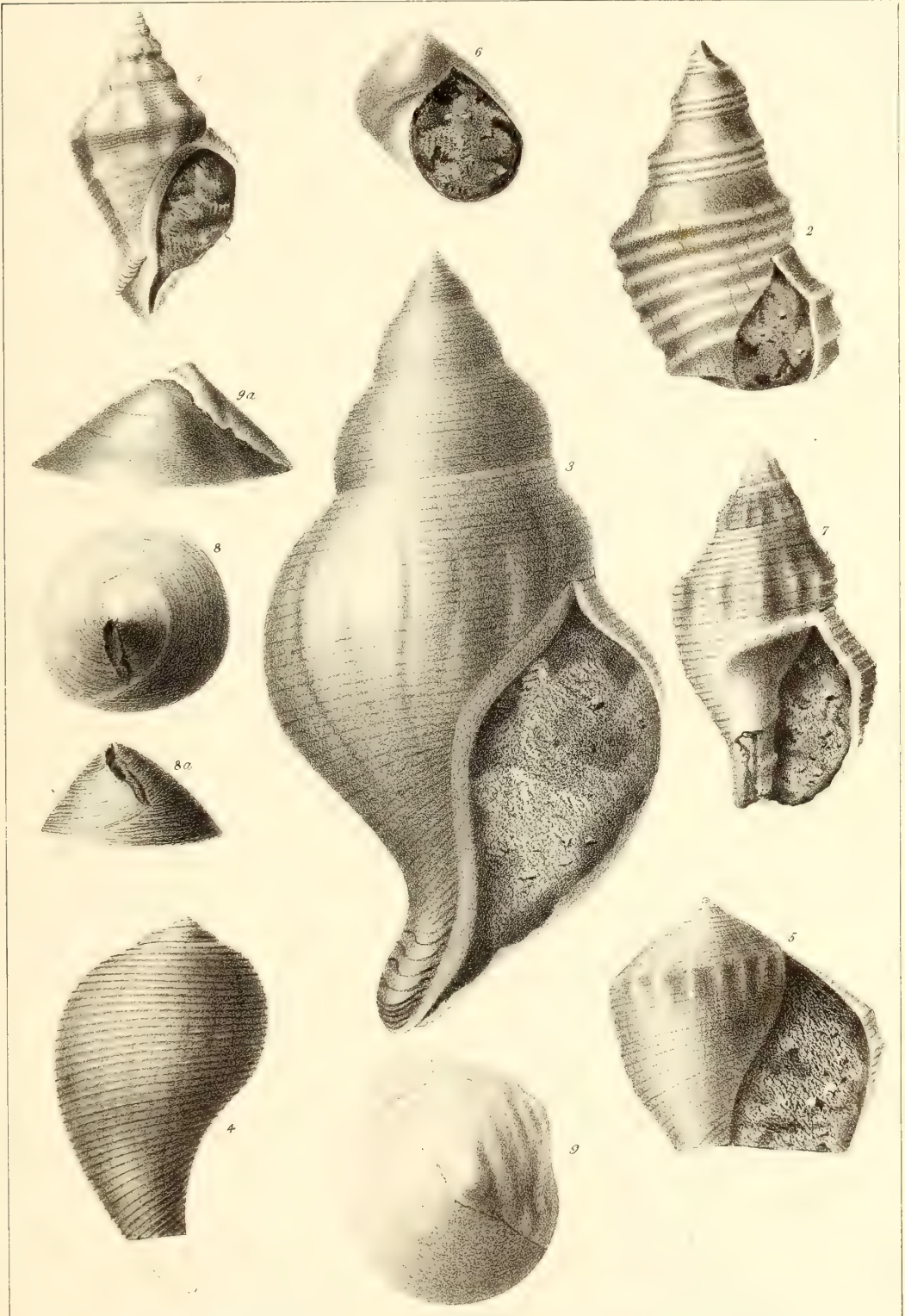
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PLATE 14.



W. M. Gabb, del

Bowen & Co lith. Phila. da



TABLE I

Year	Population	Area
1950	1,000,000	100,000
1955	1,200,000	120,000
1960	1,400,000	140,000
1965	1,600,000	160,000
1970	1,800,000	180,000
1975	2,000,000	200,000
1980	2,200,000	220,000
1985	2,400,000	240,000
1990	2,600,000	260,000
1995	2,800,000	280,000
2000	3,000,000	300,000

PLATE XV.

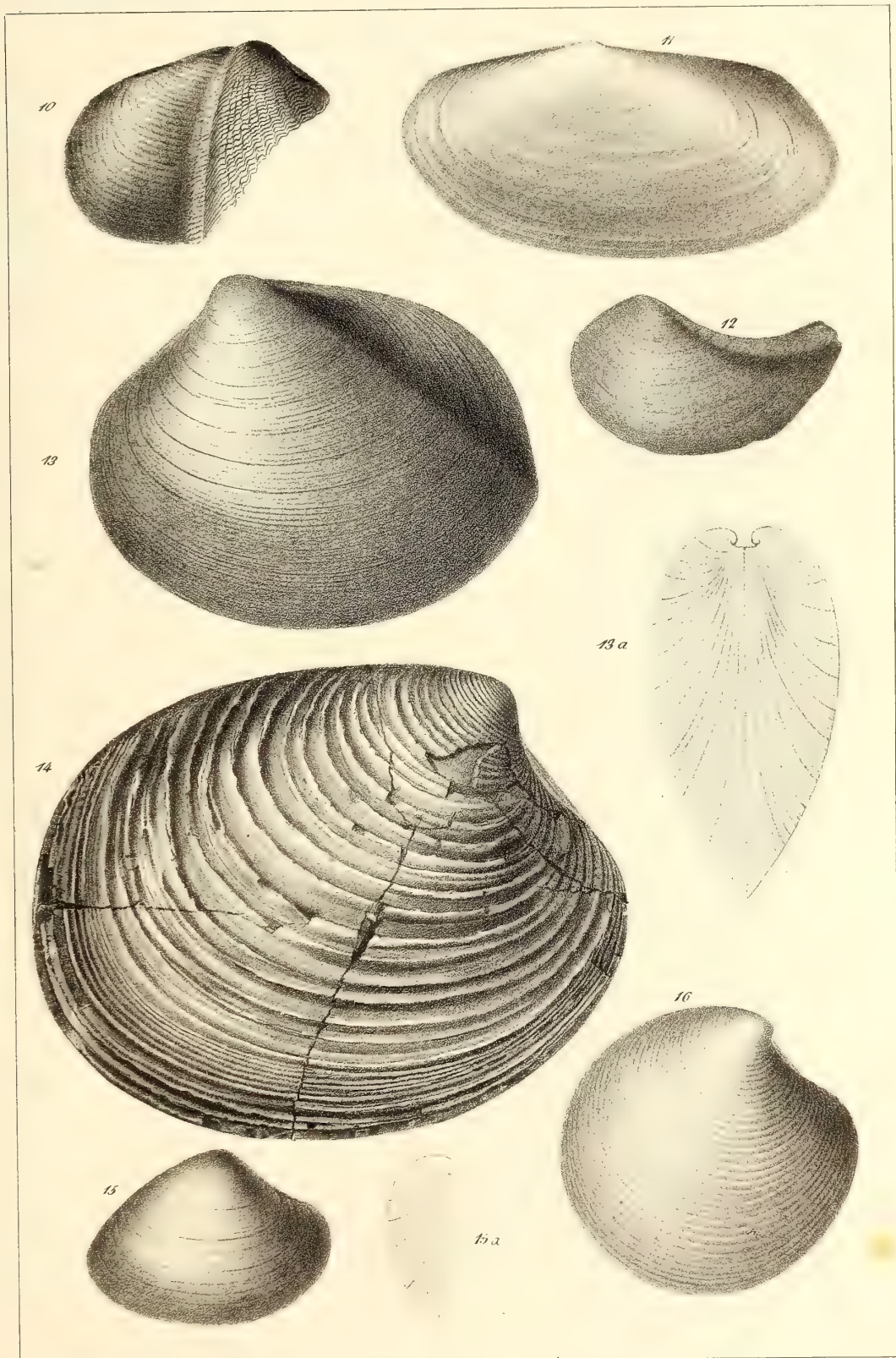
		PAGE
Fig. 10.	ZIRPHEA GABBII.	52
Fig. 11.	? SILIQUARIA EDENTULA.	53
Fig. 12.	CLIDOPHORA PUNCTATA.	54
Fig. 13, 13 a.	? HEMIMACTRA OCCIDENTALIS.	54
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PLATE 15.



W. M. Gabb, del.

Bowen & Co lith. Phila. da



PLATE XVI.

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PLATE 18.

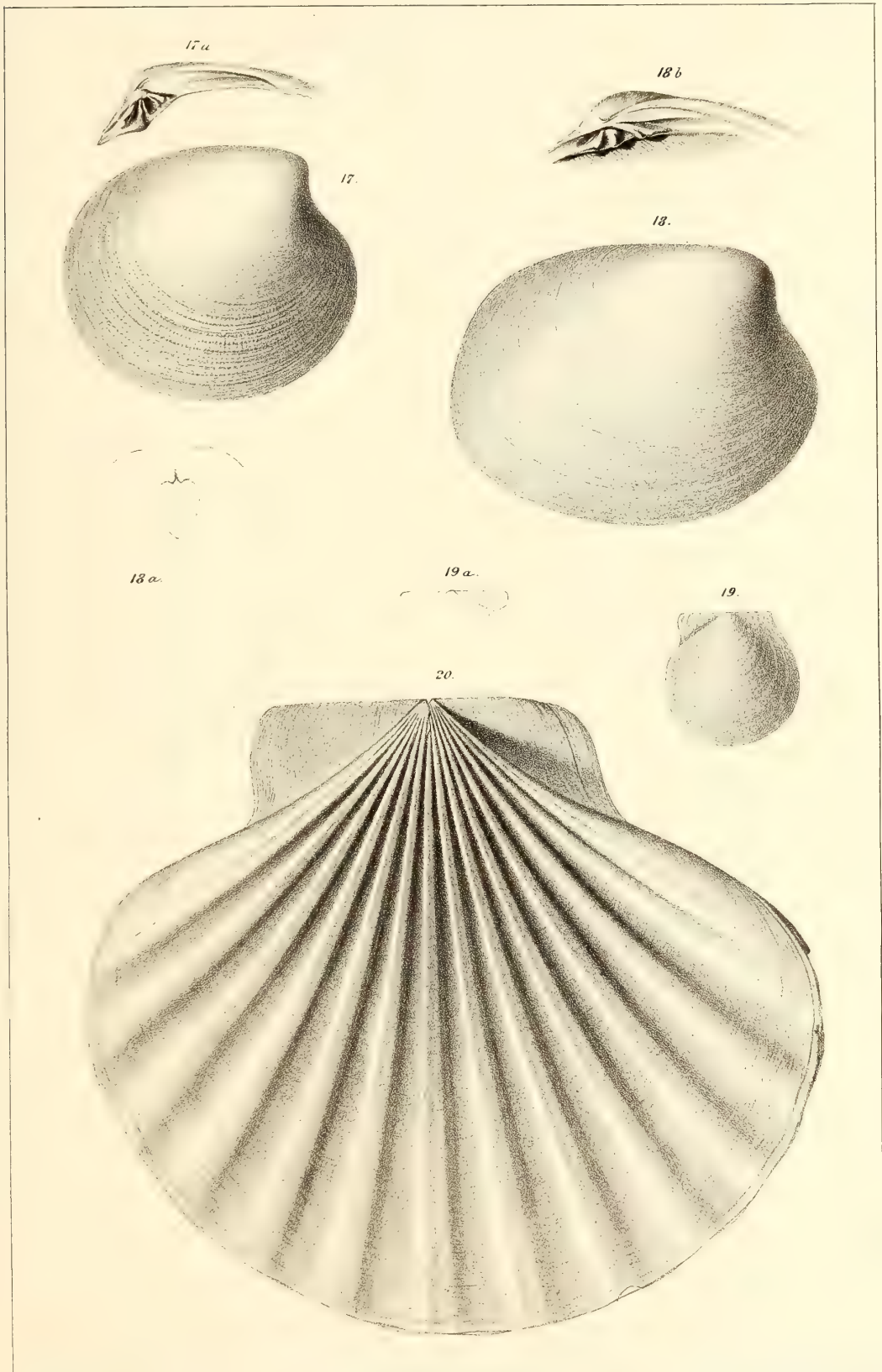


PLATE XVII.

Fig. 21.

OSTREA VEATCHII.

PAGE

60

21 *a*. Hinge.

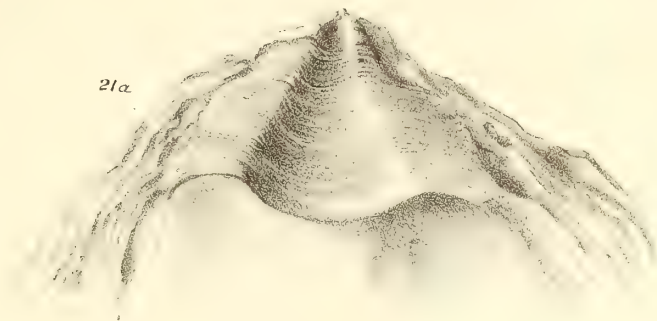
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PLATE 17.

21a



21.







PLATE XVIII.

Fig. 22.

TAMIOSOMA GREGARIA.

PAGE

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- 22 *a.* View of Mr. Conrad's original specimen, showing the internal plates.
- 22 *b.* End view of the same, showing the thickness of the walls and the surface of the septa.
- 22 *c.* Magnified view of a section of the walls and of the origins of the transverse septa.
- 22 *d.* Magnified view of a portion of the internal surface with the remains of septa.
- 22 *e.* Section of the wall of *RADIOLITES SQUAMOSA*, to exhibit the similarity of the columnar structure.

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PLATE 18.

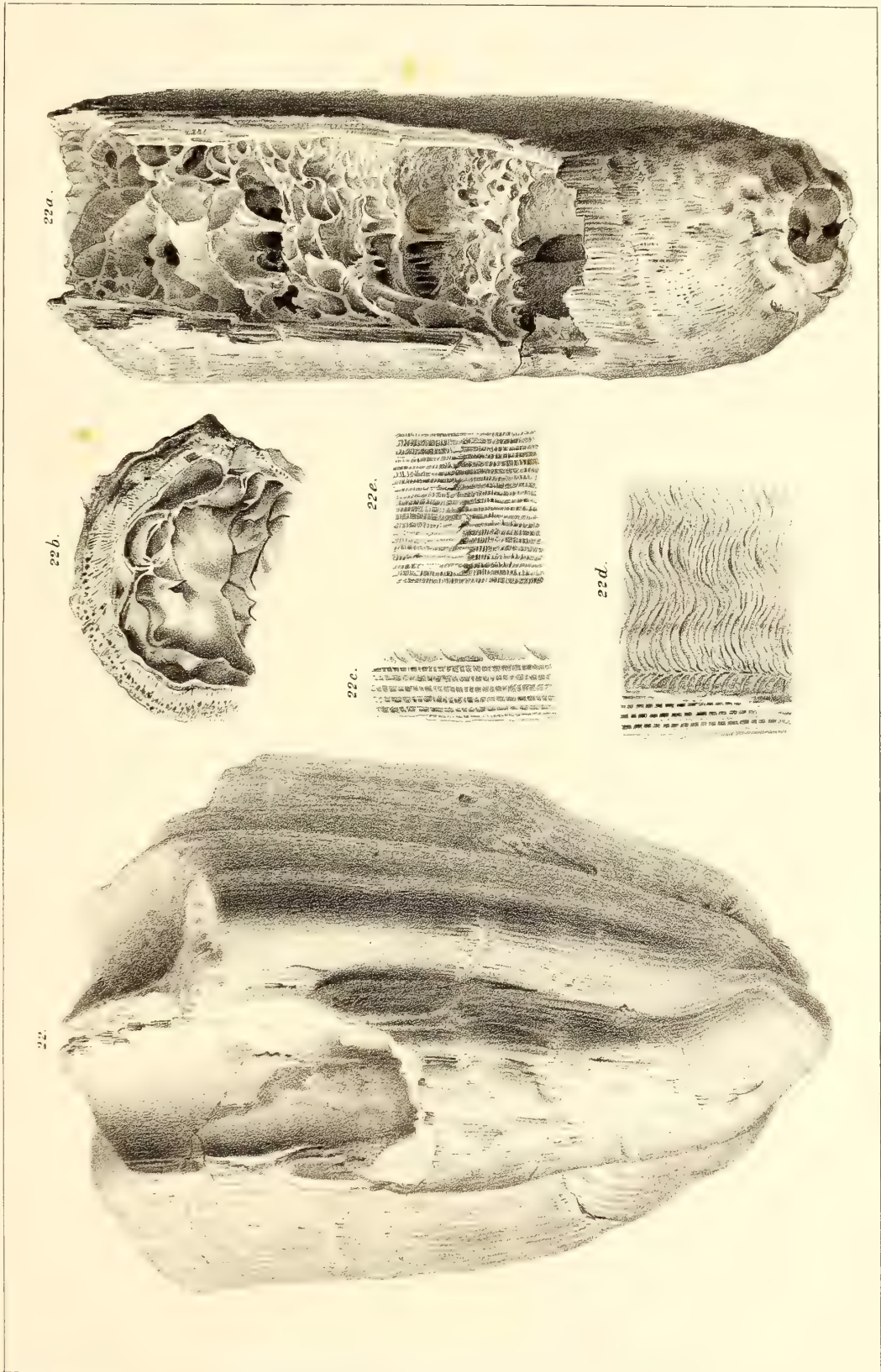




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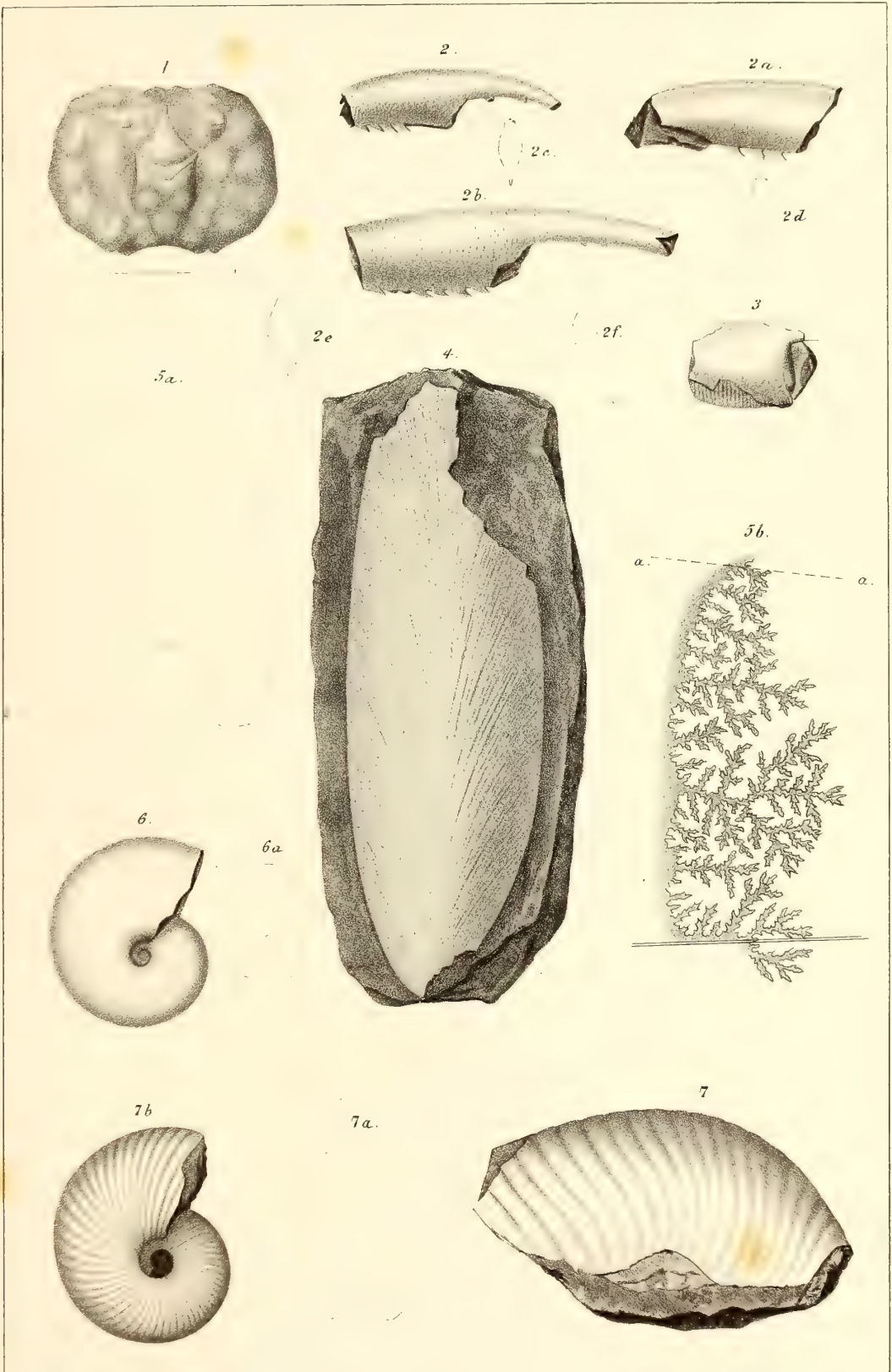




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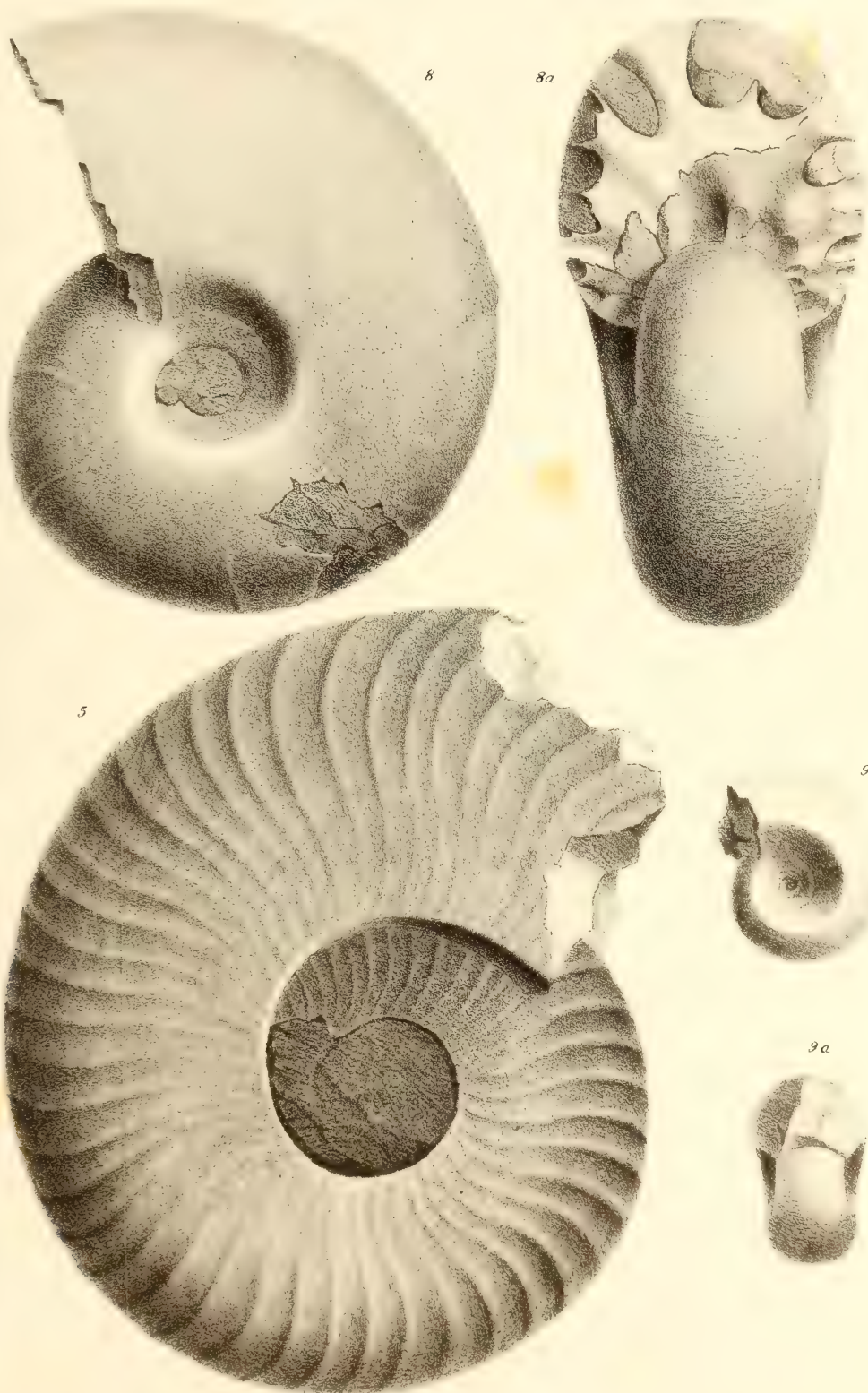






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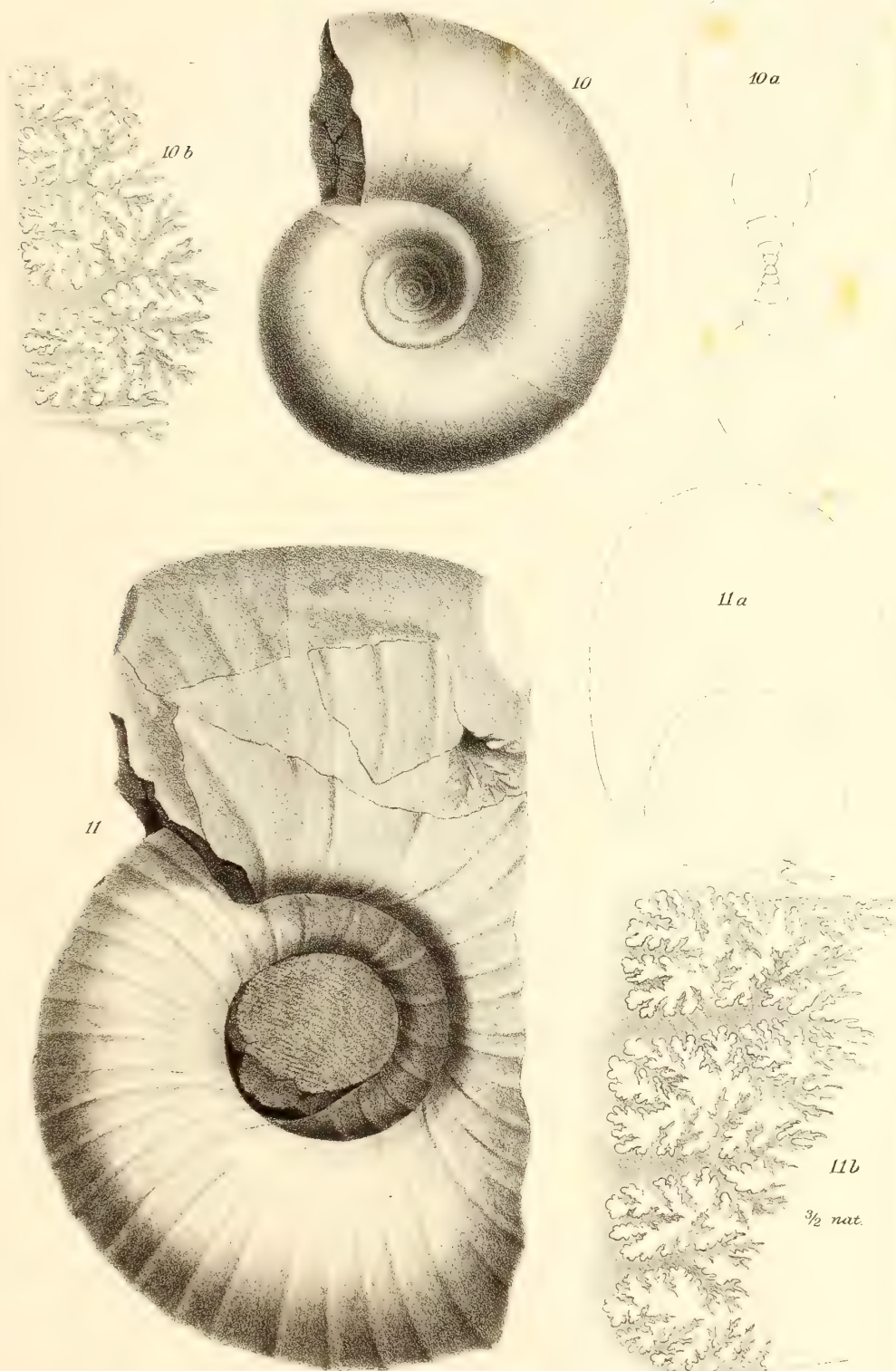






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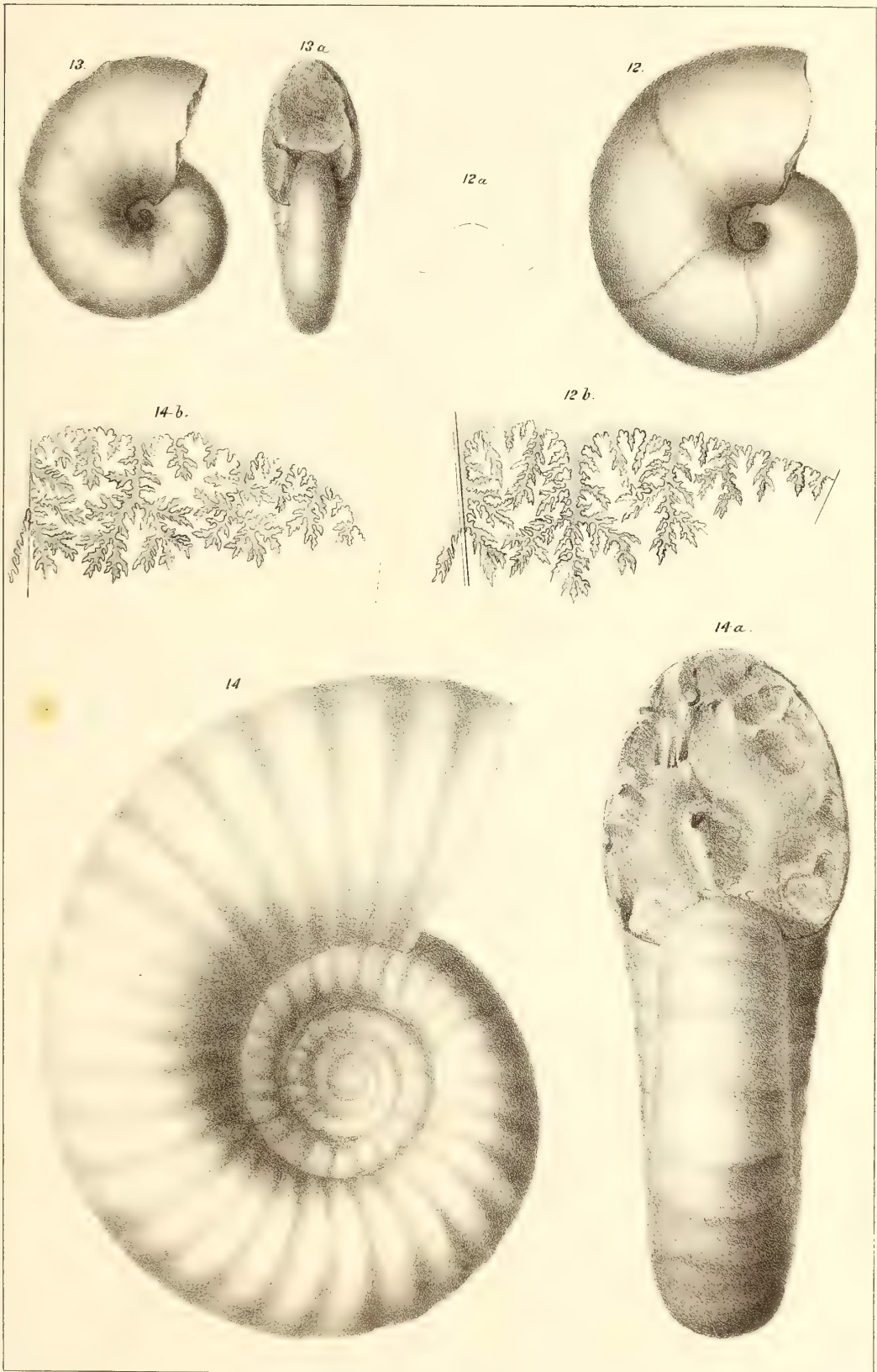
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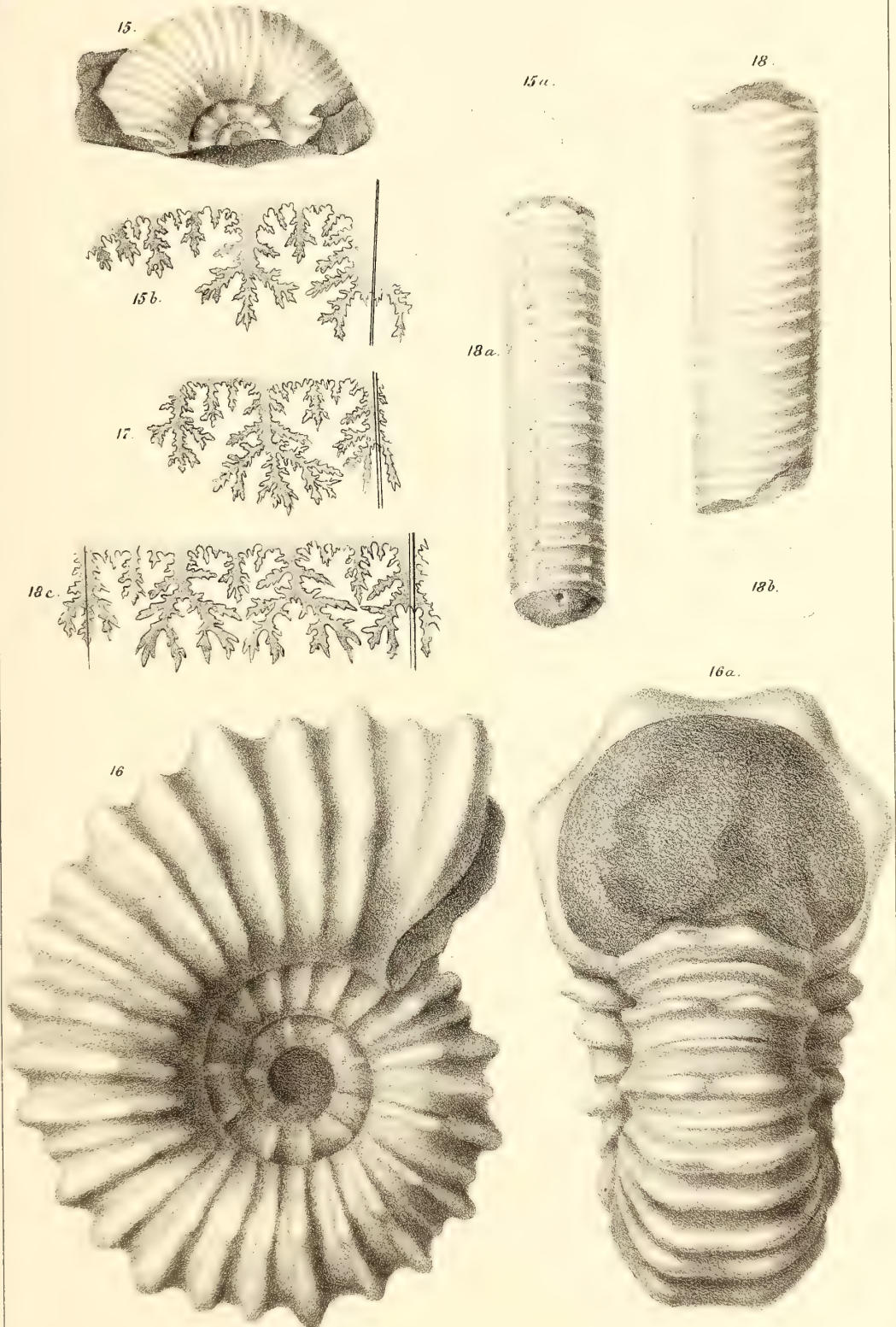


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ANCYLOCERAS PERCOSTATUS.

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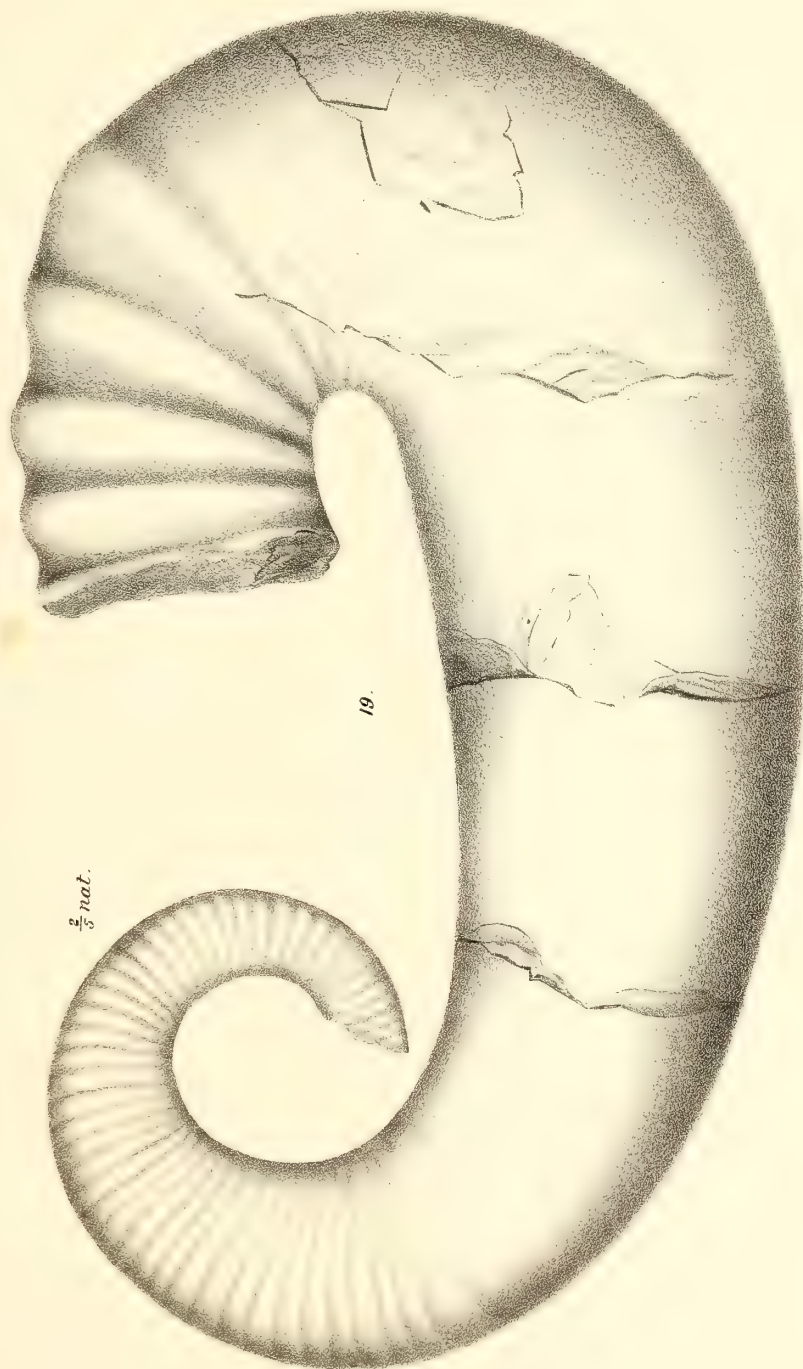




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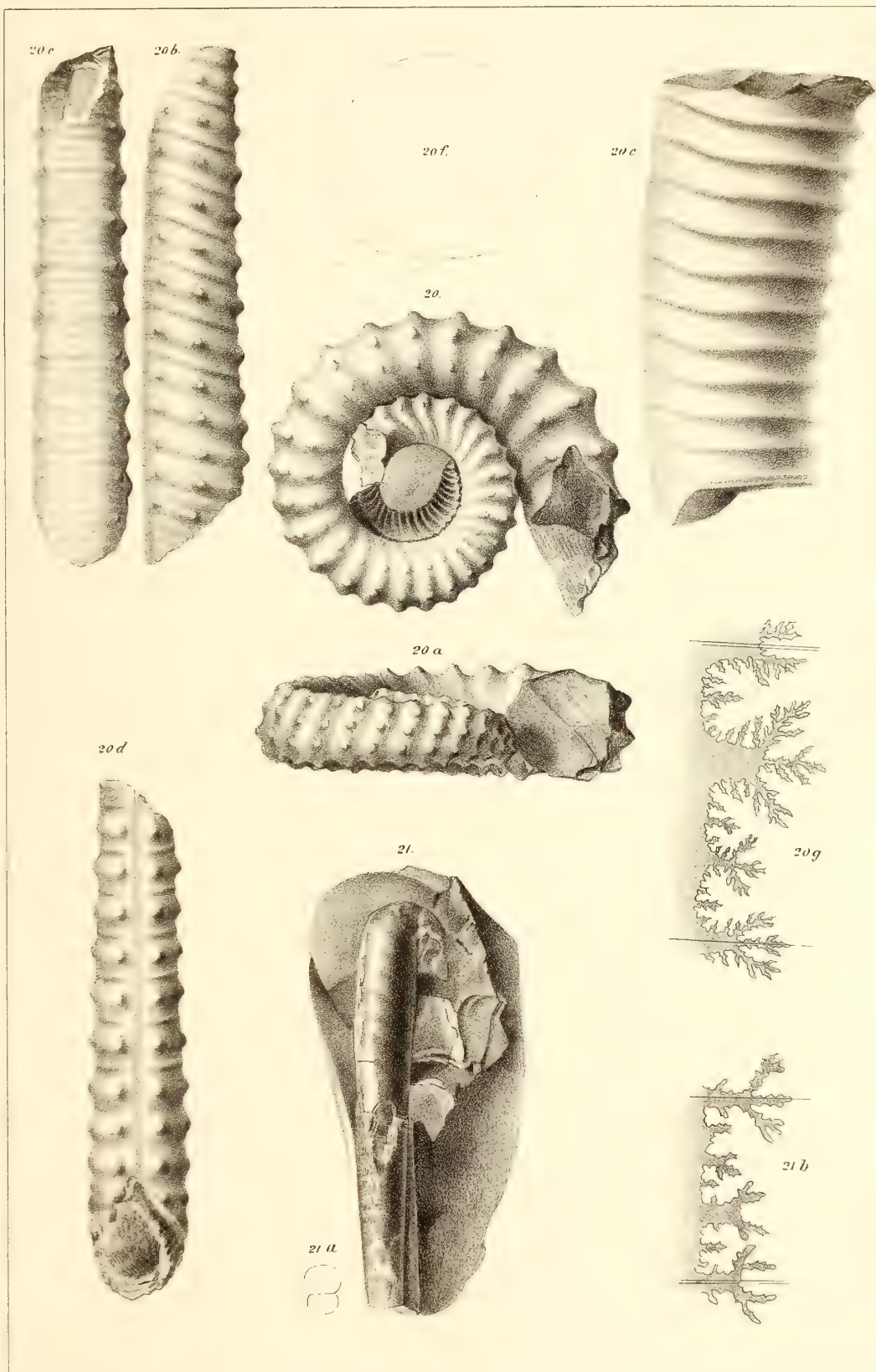




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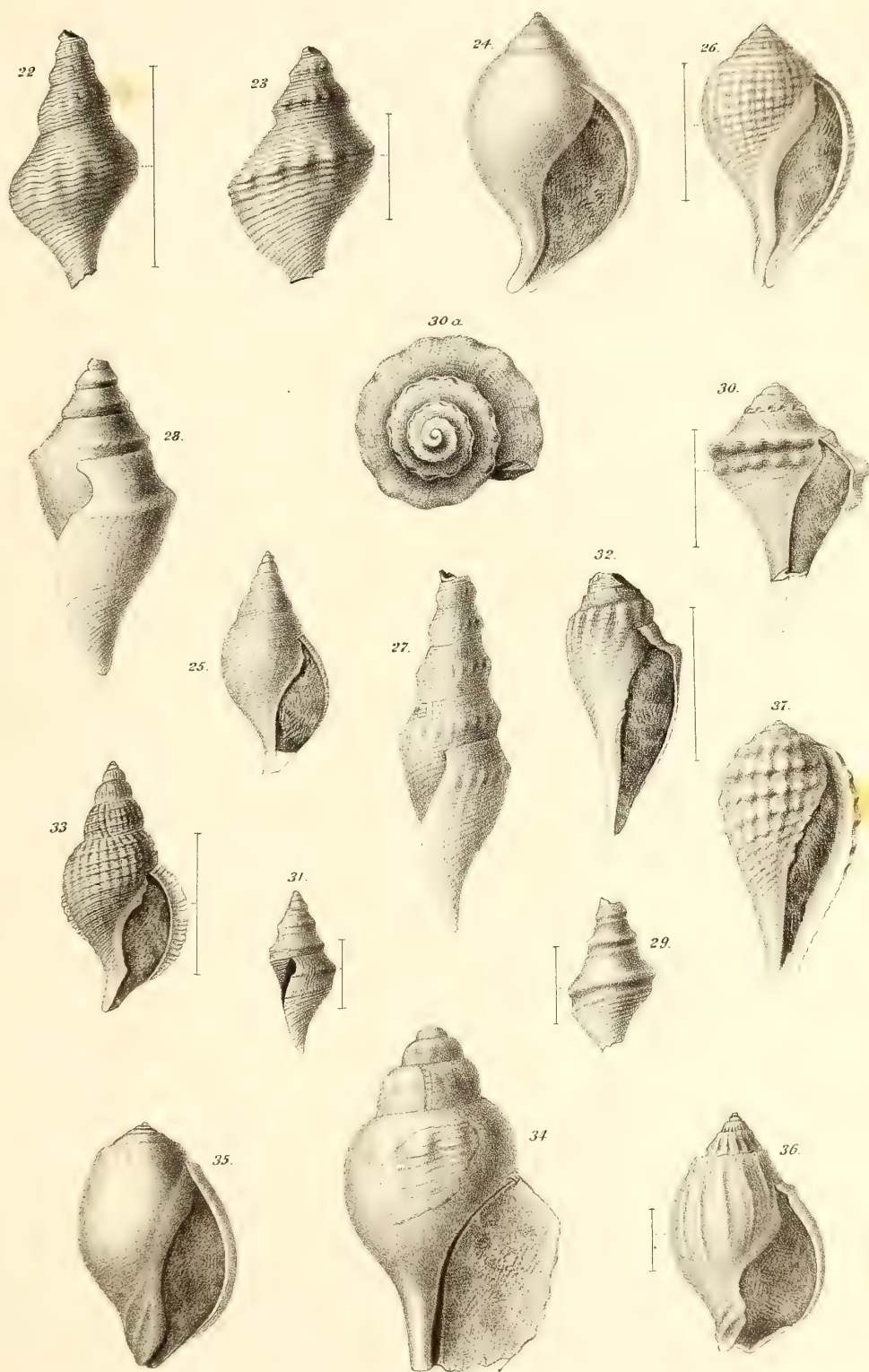




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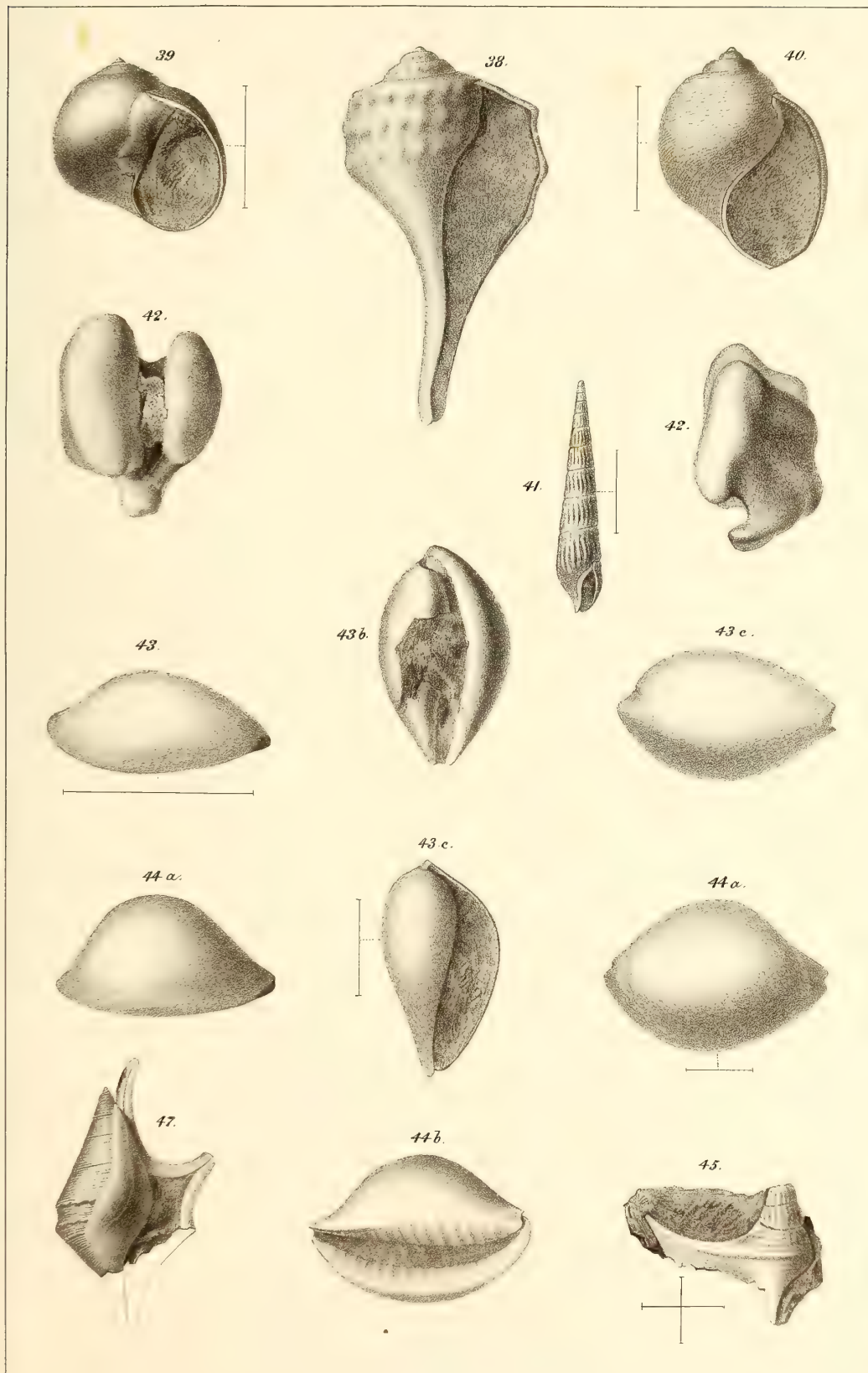






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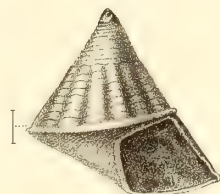
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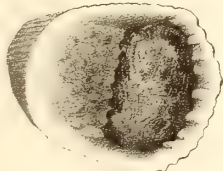
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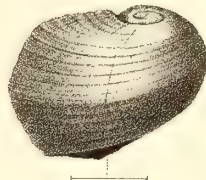
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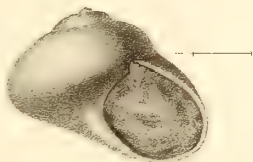
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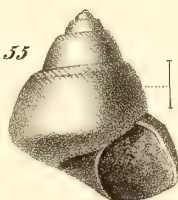
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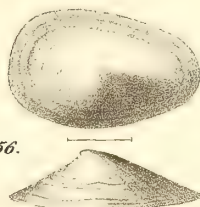
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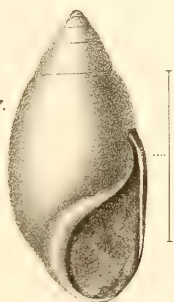
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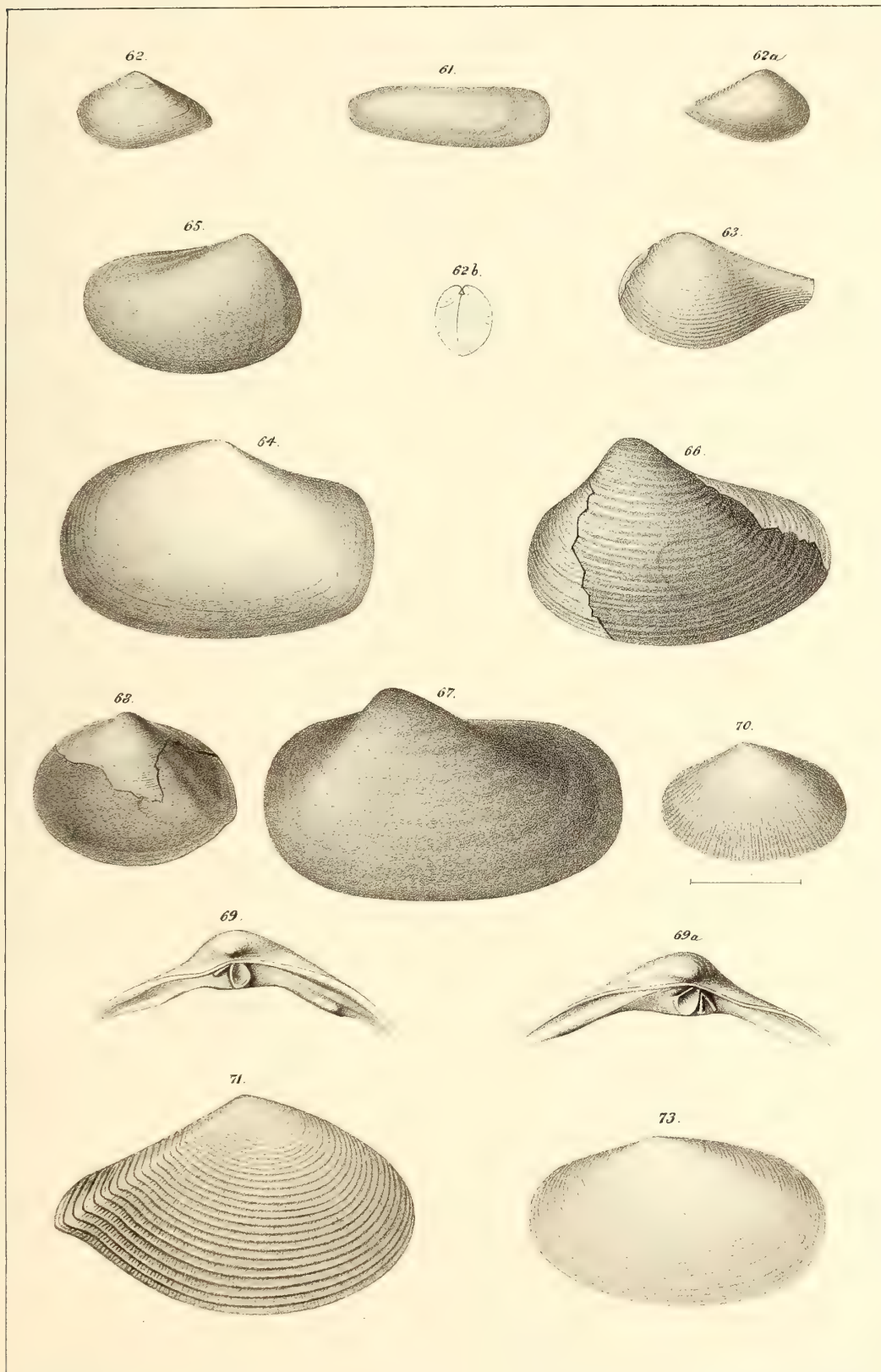






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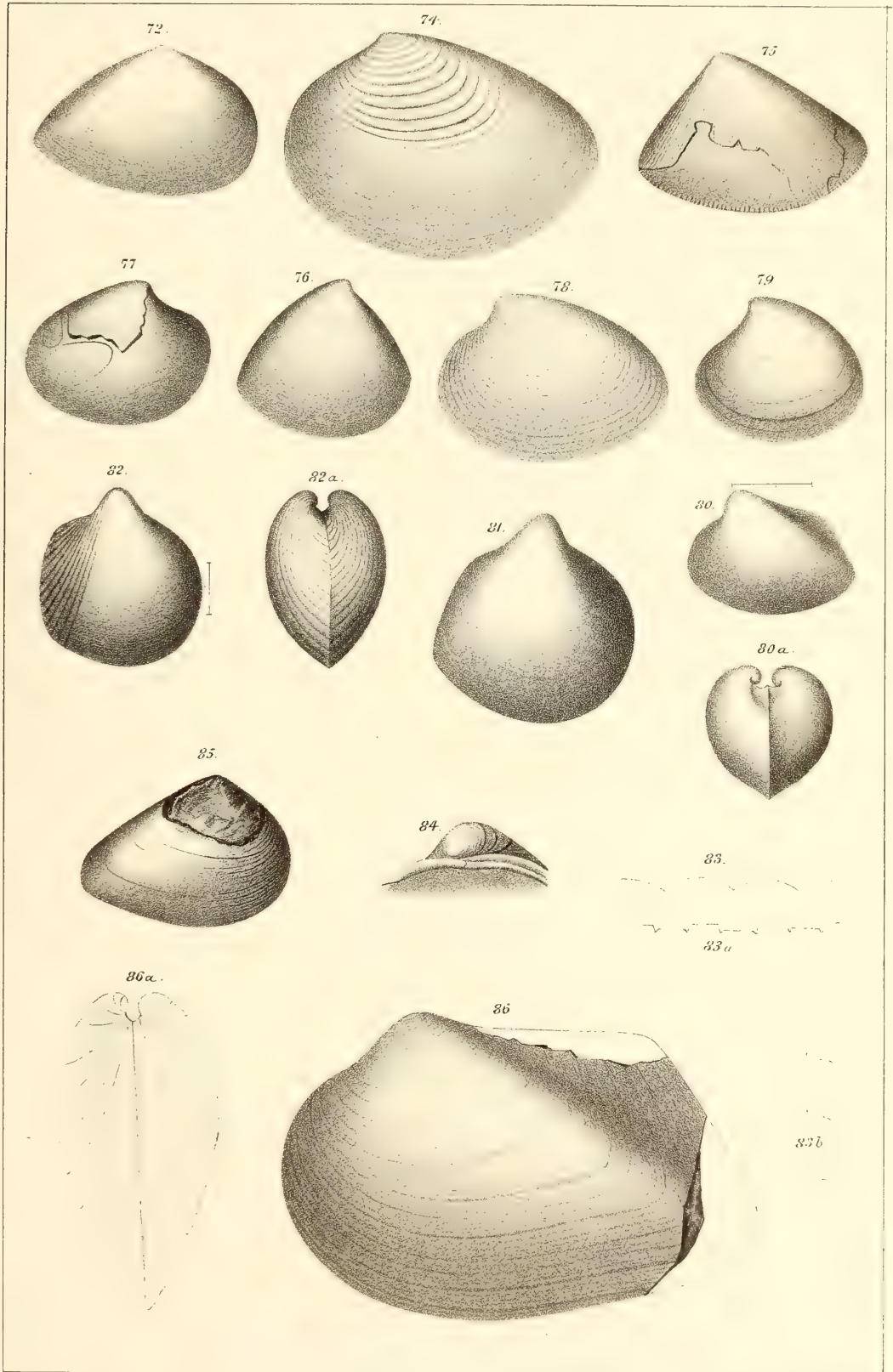
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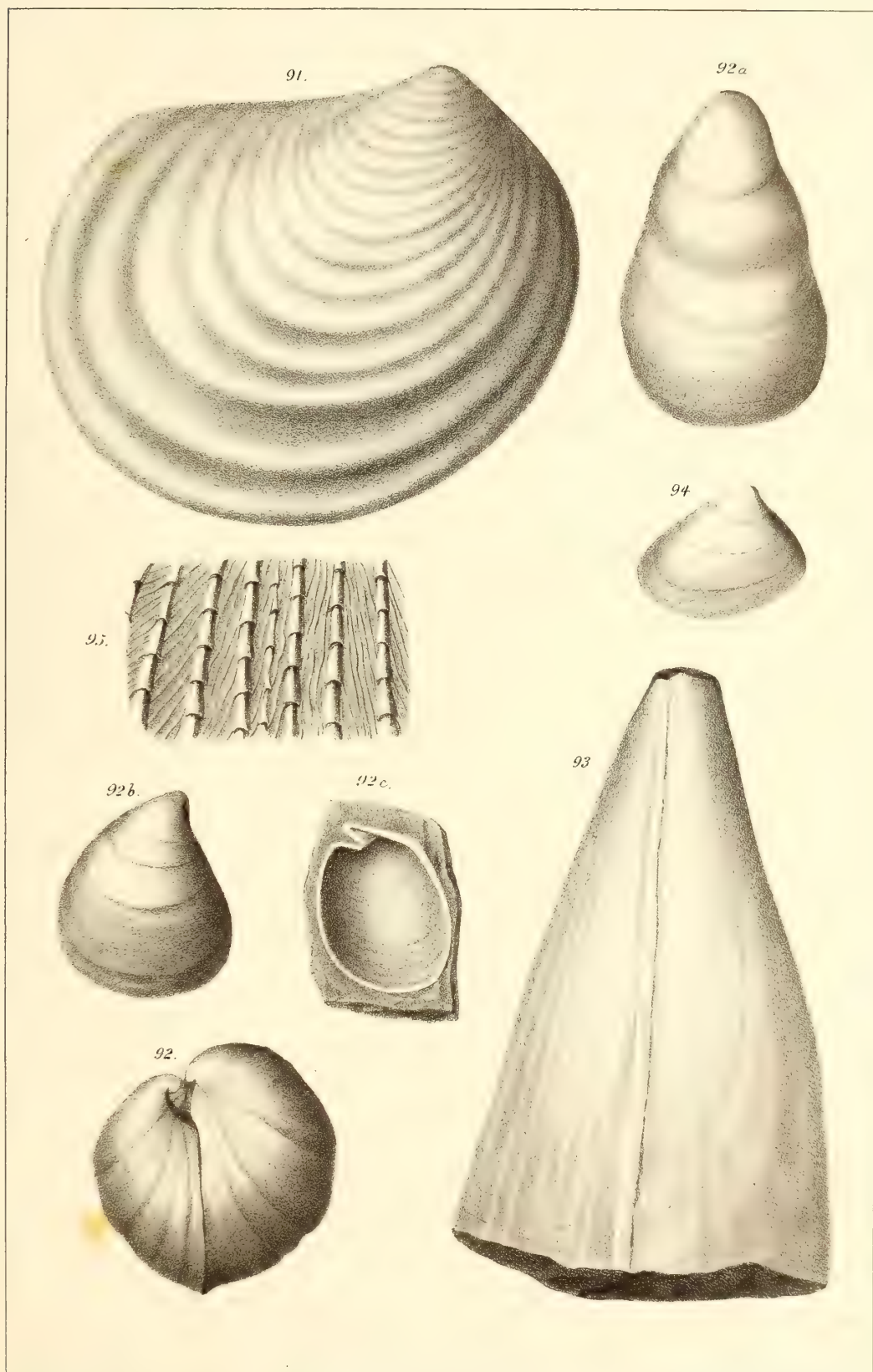






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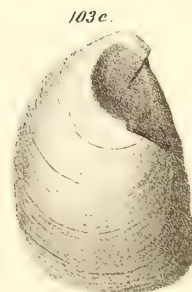
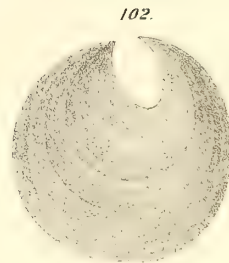
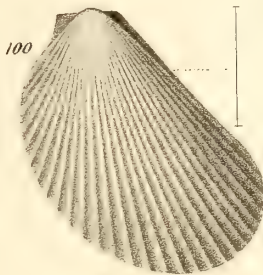
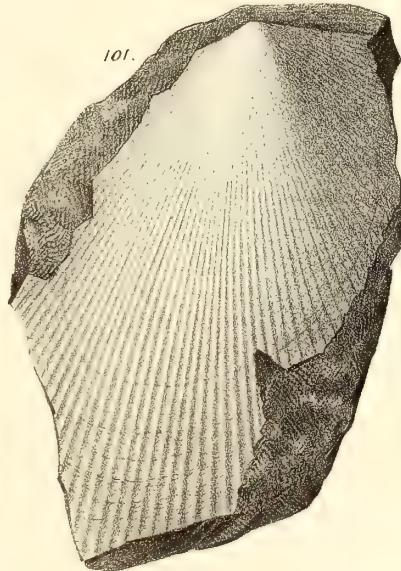
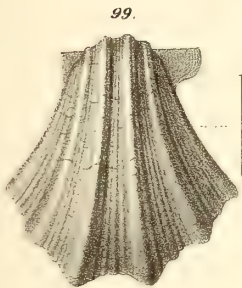
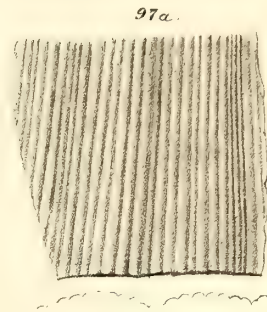
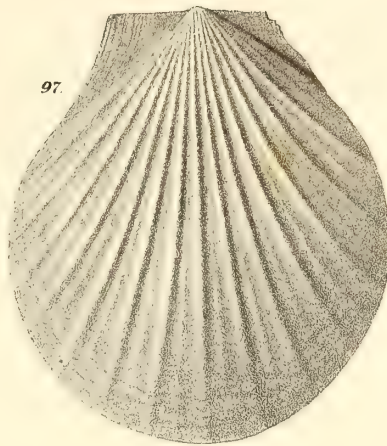






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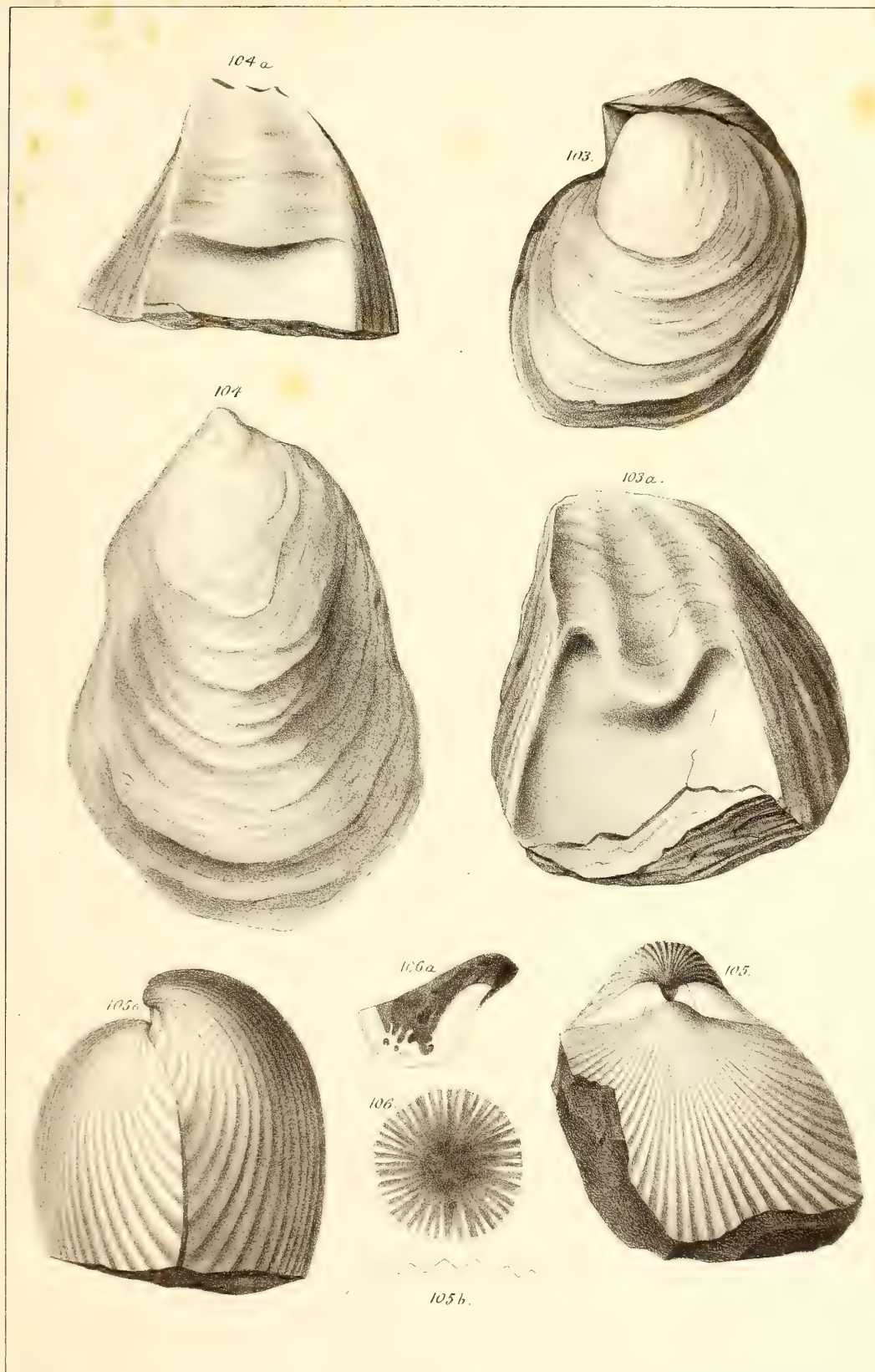




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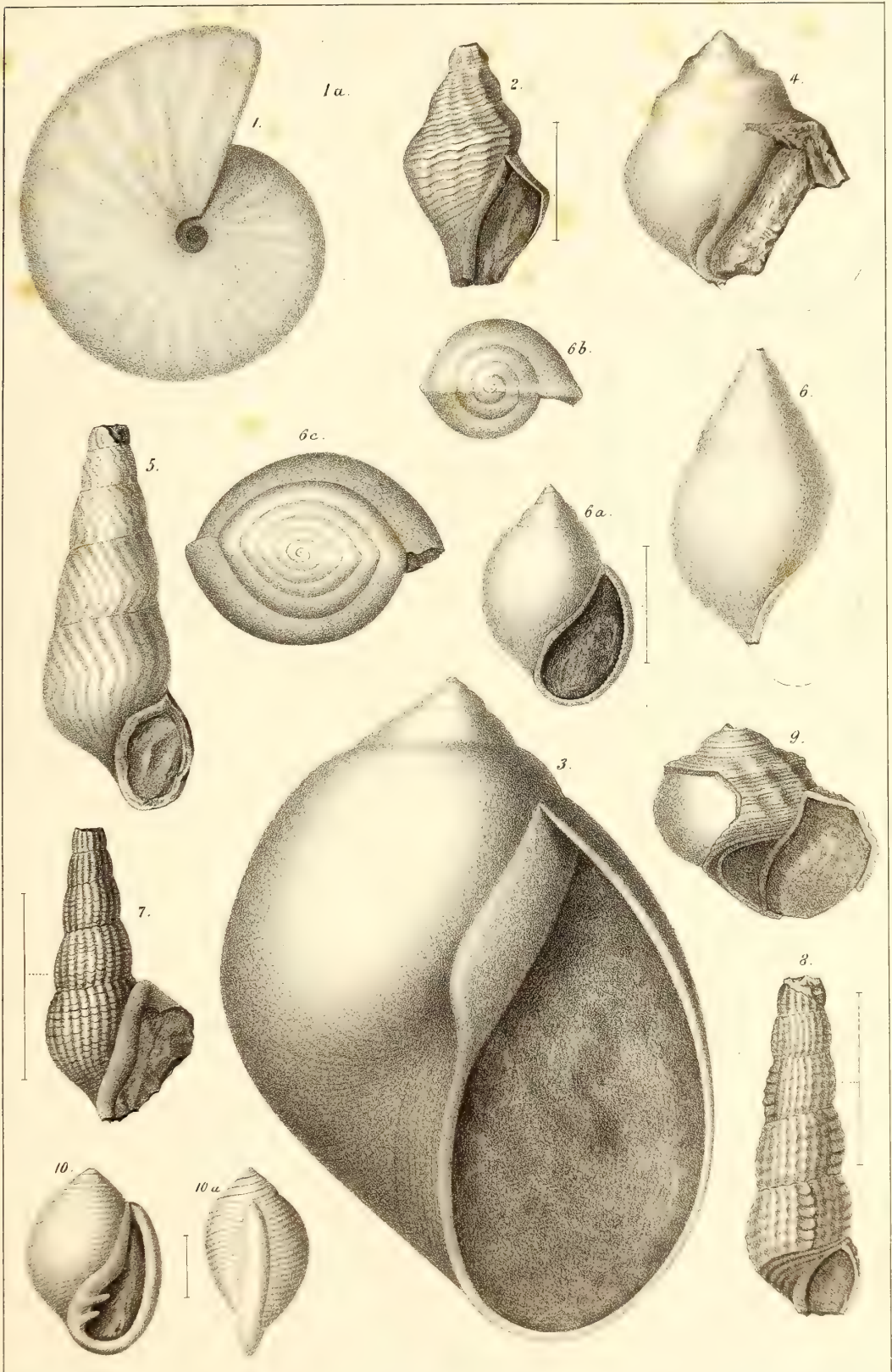






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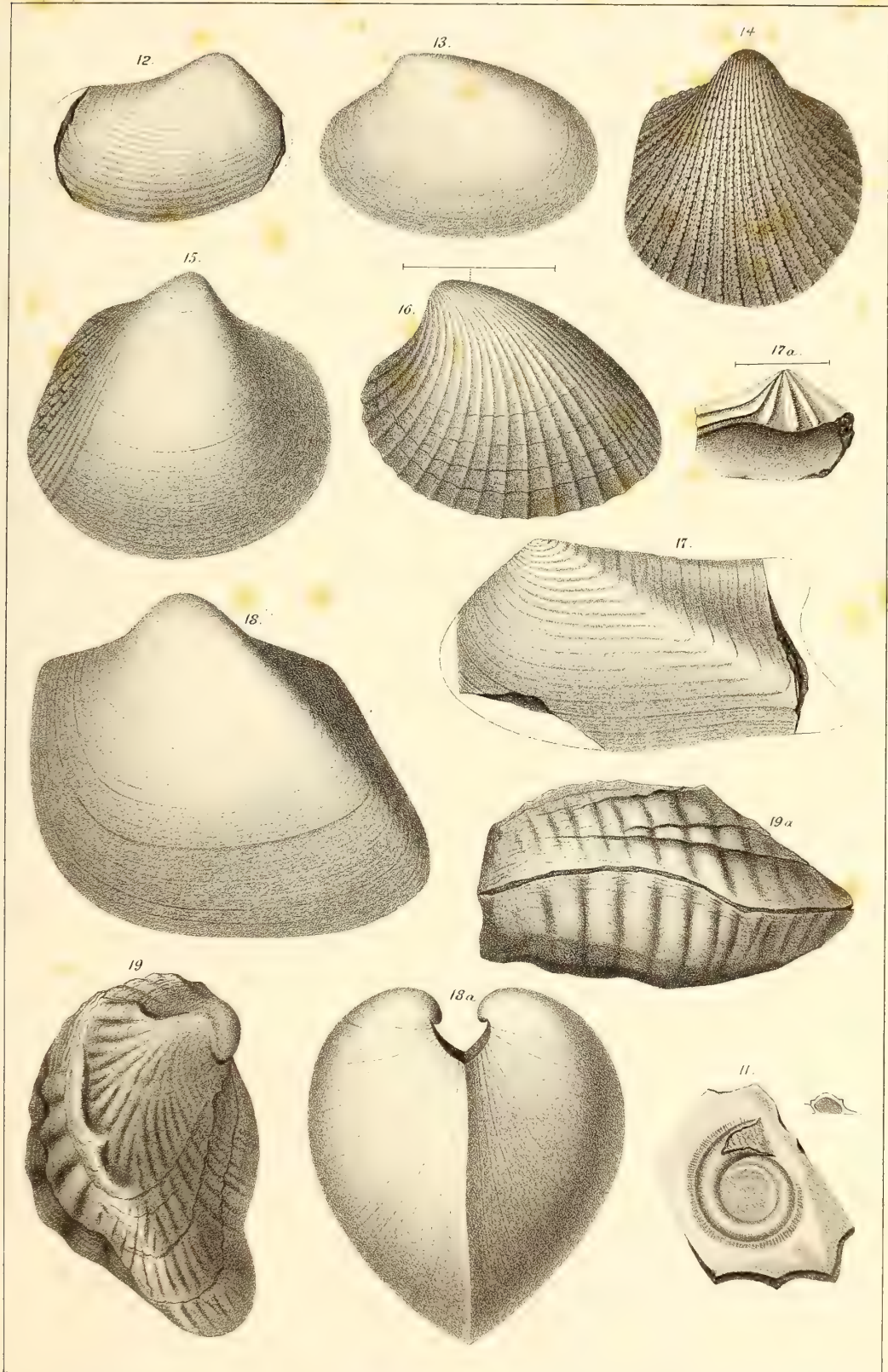
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